Proceedings of the
American Association of Textile Chemists and Colorists

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FEBRUARY 13, 1956

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AATCC Newsgram

February 13, 1956

FROM THE COUNCIL CHAMBER

Council at its January meeting in New York accepted with regret the formal resignation of Harold C Chapin as secretary of the Association, to be effective August 1, 1956. Dr Chapin's resignation has set in motion a committee on organization, which will formulate a plan to fulfill the administrative requirements of AATCC in the future.

Several new committee chairmen, including those for ECR and TCR were approved by Council at the meeting.

Charles W Dorn succeeds Leonard S Little as chairman of the Executive Committee on Research. Charles A Sylvester succeeds Mr Dorn as chairman of the Technical Committee on Research. Mr Sylvester's appointment as vice chairman of ECR was also approved. Matthew J Babey will serve as vice chairman of TCR, and Jackson A Woodruff, as secretary.

The line-up of chairmen of other committees was approved as follows: Appropriations — A E Sampson; Publications — W M Scott; Membership and Local Sections — J H Jones; Constitution and ByLaws — H C Chapin; Technical Supplies — H C Chapin; Corporate Membership — A E Johnson; Bibliography — W H Cady; Colour Index Editing — W H Cady; Colour Index Marketing — A E Sampson; Conventions — G O Linberg; Technical Program — W M Scott; President's Advisory — J R Bonnar; Intersectional Contest — E D McLeod; Perkin Centennial — R W Jacoby; Quartermaster — Air Force Dye Survey — W A Holst; Sectional Advisory Research — E W K Schwarz; Inter-Society Relations — H F Herrmann; Subject and Speakers' Bureau — M J Babey; and Publicity — J A Doyle.

Council also approved the establishment of a new committee, to be known as the Archives Committee, which will be charged with collecting and codifying historical material of the Association and its activities. Sidney M Edelstein, Dexter Chemical Corp, will serve as chairman of this committee.

President Jacoby, presiding at the meeting, introduced the two new vice presidents for 1956: Ernest R Kaswell, representing the New England Region, and Frederick V Traut, representing the Central Atlantic Region. They join Joseph H Jones, representing the Western Region, Walter M Scott, representing the Southern Region, as vp's.

Several new Councilors, recently elected among the 14 local sections of AATCC, were introduced at the meeting. Mr Jacoby expressed the tremendous debt of the Association to Leonard Little, retiring ECR chairman, and the Council members applauded Mr Little with a rising vote of thanks.

Upon the invitation of Henry A Rutherford, Head of the Department of Textile Chemistry, Director of Chemical Research, North Carolina State College, L H Hance, president of the Institute of Textile Technology, Charlottesville, Va, spoke briefly to the Councilors, urging their cooperation with textile school deans in promoting textiles and textile chemistry as a career, to high school students. The future of the schools and the industry, he said, depends on attracting new personnel. In June, Dr Hance reported, there were some 2,000 textile jobs to be filled, but only 500 graduates to fill them, and this situation will continue unless aggressive promotion is undertaken.

The Convention Committee made no recommendations about the Association's 1960 convention location, but confirmed that the 1957 convention will be in Boston, the 1958 in Chicago, and the 1959 in Washington. The 1956 Convention will be part of the week-long Perkin Centennial Celebration at the Waldorf-Astoria Hotel, New York.

Harley Y Jennings, chairman of the Olney Medal Award Committee, invited submissions of candidates' names and backgrounds by March 1,1956, addressed to Dr Chapin, P O Box 28, Lowell, Mass.

AATCC CALENDAR

COUNCIL

Apr 20 (Benjamin Franklin Hotel, Philadelphia, Pa); June 15; week of Sept 10th (New York, N Y); Nov 16; Jan 18, 1957.

NATIONAL CONVENTIONS

Sept 13-15, 1956 (Waldorf-Astoria, New York) (as part of the Perkin Centennial, Sept 10-15); 1957 (Boston); 1958 (Chicago); 1959 (Washington, DC)

HUDSON-MOHAWK SECTION

March 16 (Hotel Johnstown, Johnstown, N Y); May 18 (Ladies Nite); June 22 (Annual Outing).

MID-WEST SECTION

May 5 (Plankington Hotel, Milwaukee, Wis); June 16 (Outing—Browns Lake Resort, Burlington, Wis)

NEW YORK SECTION

Mar 2 (Hotel Delmonico, New York, N Y); Mar 23, Apr 27, May 18 (Kohler's Swiss Chalet, Rochelle Park, N J).

NIAGARA FRONTIER SECTION

Mar 3 (Canada—meeting to be held in conjunction with Ontario Section, CATCC); Apr 27 (U S).

NORTHERN NEW ENGLAND SECTION

Feb 17 (U S Quartermaster Research & Development Command, Natick, Mass); Apr 27 (Lowell Technological Institute, Lowell, Mass); Sept 28 (Annual Outing —Wachusett Country Club, West Boylston, Mass); Oct 19 (Science Park, Boston, Mass); Dec 1 (Annual Meeting—Hotel Vendome, Boston)

PACIFIC SOUTHWEST SECTION

Feb 6 (Gourmet Restaurant, Beverly Hills, Calif).

PHILADELPHIA SECTION

Mar 2 (Adelphia Hotel, Philadelphia); Apr 20 (Ladies' Night—Benjamin Franklin Hotel, Philadelphia); May 25 (Annual Outing — Huntingdon Valley Country Club, Abingdon, Pa); Sept 28 (Abraham Lincoln Hotel, Reading, Pa); Nov 2 (John Bartram Hotel, Philadelphia, Pa); Dec 7 (Kugler's Restaurant, Philadelphia, Pa)

PIEDMONT SECTION

Apr 7 (Sir Walter Raleigh Hotel, Raleigh, N C); June 8-9 (Outing—Mayview Manor, Blowing Rock, N C); Oct 6 (Annual Meeting—Hotel Charlotte, Charlotte, N C)

RHODE ISLAND SECTION

Feb 23 (Johnson's Hummock's Grille, Providence); Mar 22 (Crown Hotel and Providence Engineering Society); Apr 26 (Student Night, Rhode Island School of Design); May 25 (Ladies' Night, Sheraton-Biltmore Hotel); June 15 (Annual Outing, Pawtucket Country Club); Oct 18 (Johnson's Hummock's Grille); Dec 6 (Annual Meeting, Johnson's Hummock's Grille)

SOUTH CENTRAL SECTION

Feb 24, Apr 28 (Hotel Patten, Chattanooga, Tenn); June 22-23 (Lookout Mountain Hotel); Dec 1 (Hotel Patten)

SOUTHEASTERN SECTION

Feb 18 (Auburn and Pepperell, Ala).

WESTERN NEW ENGLAND SECTION

Mar 16 (Rapp's Restaurant, Shelton, Conn); May 11 (Ladies' Night—Waverly Inn, Cheshire, Conn); June 15 (Outing); Oct 5 (Annual Meeting—Hartford, Conn); Nov 16 (Rapp's Restaurant, Shelton, Conn)

EMPLOYMENT REGISTER

This column is open for two insertions per year, per member, without charge. Blanks can be obtained from, and filed with, the Secretary of the Association, Post Office Box 28, Lowell, Mass. It is understood that these will be open to inspection by prospective employers who can obtain further information from the Secretary.

56-1

Education: BTC, textile chemistry & dyeing, with honors.

Experience: supt & asst manager, dyeing and finishing.

Age: 45; married; references from all employers; location, in U S, not essential.

1-16, 2-13

CORRECTION

ATTENTION is called to an error which appeared in the December 19th issue under "Activities of the Local Section." It was stated that Raymond B Taylorson, who had been elected a councilor from the Rhode Island Section for 1956, is affiliated with Sandoz Chemical Works, Inc.

Mr Taylorson is New England manager for Verona Dyestuff Co.

NOTICE

To Authors and Section Officials

Under a new ruling of the Publications Committee, all papers presented before local sections of AATCC must be submitted direct to the publishers of the AMERICAN DYESTUFF REPORTER, 44 East 23rd St, New York 10, N Y. Two copies of each manuscript should be submitted in accordance with the "Notice to Authors", which appears periodically in the Proceedings of AATCC.

AATCC Monograph No. 2

"THE APPLICATION OF VAT DYES"

"The group of fifteen editors responsible for this monograph consists of a well-balanced cross-section of American industry concerned with the production, marketing and application of vat dyes. The AATCC is to be congratulated on the production of a comprehensive survey of American vat dyeings and printing practice which is the major theme of this application . . . the book will be useful as a work of reference at this side of the Atlantic and as a working manual for the American colorists for whom it was designed. . . . If a clear account of American practice is required . . . the enquirer *must* have access to this volume."—*JOURNAL OF THE TEXTILE INSTITUTE* (England).

"This monograph contains the work of many mill-experienced authors, plus good, sound chemical and application principles developed in the laboratories and mills enjoying AATCC membership. . . . This book puts between two covers much information that a dyer is constantly searching for. It is a good investment for any laboratory, dyehouse, or printshop."—*TEXTILE WORLD.*

". . . this monograph should be in the hands of every user of vat dyestuffs, every student and every teacher. The book is well indexed and includes valuable lists of equivalent trade names. It will certainly take its place as a standard book of reference."—*"JOURNAL OF THE SOCIETY OF DYERS AND COLORISTS* (England).

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1955 National Convention——

DYEING AND HEAT TREATMENT OF ARNEL† TRIACETATE*

FRED FORTESS, WILLIAM J MYLES, VICTOR S SALVIN and WERNER A SCHOENEBERG

Summit Research Laboratories
Celanese Corp of America
Summit, N J

Arnel cellulose triacetate may be classified as a new hydrophobic fiber resistant to swelling, and intermediate in dyeing properties between regular acetate and Dacron. During the last year, a wide variety of fabrics has been adapted to existing dyeing facilities with the achievement of a full range of shades having a high level of wash-, gas-, and light-fastness properties. Special problems in the dyeing of Arnel blends with cotton, rayon, nylon, wool and Dacron are discussed and the level of achievement illustrated. The basis for the selection of disperse (acetate) dyes and the effective use of dyeing accelerants is discussed in some detail.

The heat treatment of Arnel-containing fabrics is an essential requirement for the attainment of improved colorfastness as well as for the modification of the thermal properties of the Arnel component with respect to glazing resistance, dimensional stability, and ironing properties. Existing heat-treatment processes and their specific attributes and limitations are discussed.

INTRODUCTION

THE presentation of this paper comes approximately one year after the formal announcement in October, 1954 by the Celanese Corporation of America of the commercial availability of Arnel triacetate fiber. Even at this time Arnel remains the newest addition to the textile industry's working fibers. The introduction of any new textile fiber provides many challenges as well as opportunities, but the first requirement is that it can be readily and economically adapted to existing processing facilities and that it can be converted into many of the standard fabric constructions for a wide range of end uses.

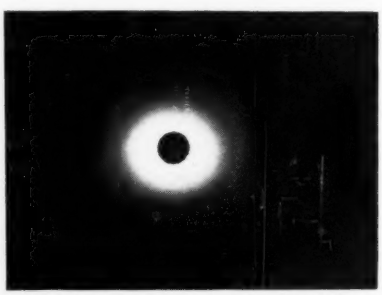
During this first year of the commercialization of Arnel, it has been possible, through the integrated cooperation of many fiber customers and commission dyers, to process a large yardage of Arnel-containing fabrics in order to compare the dyehouse processing properties of Arnel and its blends with other fibers.

Earlier in the year Stoll *(1)* discussed "Textiles with New Properties from Cellulose Triacetate" in which particular stress was placed upon the modification of Arnel fabric properties after a treatment at elevated temperatures. More recently Fortess *(2)* summarized the preliminary experience with the "Dyeing, Finishing and Heat Treatment of Arnel." In this paper we shall concern ourselves primarily with a summary of the more extensive experience with the dyeing properties and the level of color fastness which can be achieved under commercial conditions through the use of selected disperse (acetate) dyes and dyes for Dacron polyester fiber, the proper use of accelerants, and the effective use of heat treatment processes.

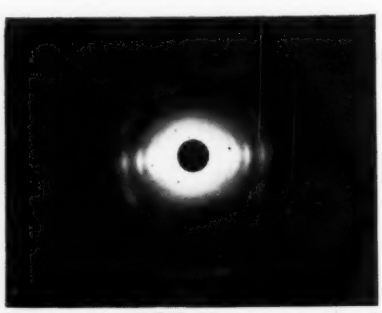
DISCUSSION

THE FUNCTION AND EFFECTS OF HEAT TREATMENT —— Although Arnel fabrics are normally heat treated after dyeing as a final processing step, usually in conjunction with silicone finishing, the importance of this treatment to the achievement of essential fabric and color fastness properties justifies that it be discussed first. Nylon, Dacron, and the acrylic fibers are all produced under conditions where a cold or hot drawing operation is used to attain the strength properties. These conditions of preparation leave the linear molecules in the fiber under considerable strain, which, unless released before conversion into final fabric form, will result in puckering and shrinkage on washing or steaming. For this reason primarily, "heat-setting" procedures were developed to release the internal strains and stabilize or set these fibers, usually in fabric or garment form.

Stoll *(1)* has summarized our current knowledge of the several effects of treating Arnel fabrics at elevated temperatures, and these are listed in Table I. Since, in addition to relaxation or stabilization, the Arnel fabric also shows a marked increase in softening point and resistance to glazing, as well as improvement in color fastness, we prefer at this time to use the more general term *heat treatment* to describe the process.



Arnel triacetate yarn not heat treated



Heat treated at 240°C, 30 sec, constant length

Figure 1

The noticeable sharpening in the X-ray pattern of the heat-treated Arnel fibers represented in Figure 1 is evidence of the crystal growth and/or increased perfection of the triacetate crystals. The schematic cross sections represented in Figure 2 illustrate the effect of heat treatment upon further diffusion of dye into the fiber. Actual photographs of dyed cross sections are represented in Figure 8, and these will be discussed later. The mechanism of the effect on wash, gas, and "O" fading fastness properties will be discussed as well as the specific details of commercially available heat-treating processes.

RESISTANCE OF ARNEL TO SAPONIFICATION —— There is always a tendency to compare a new fiber with existing fibers, and this temptation has been particularly strong with respect to Arnel triacetate and the standard acetate, which is sometimes referred to as the secondary acetate or the two-and-one-half (2½) acetate. One of the limitations of this standard acetate is its tendency to deluster and lose acetyl value by saponification if scoured, dyed, or laundry washed at elevated temperatures and at

* Presented by Fred Fortess before a Symposium on "Bringing Synthetics Up to Date", held September 23, 1955 in the Viking Room, Haddon Hall Hotel, Atlantic City, N J.

† Trade-mark.

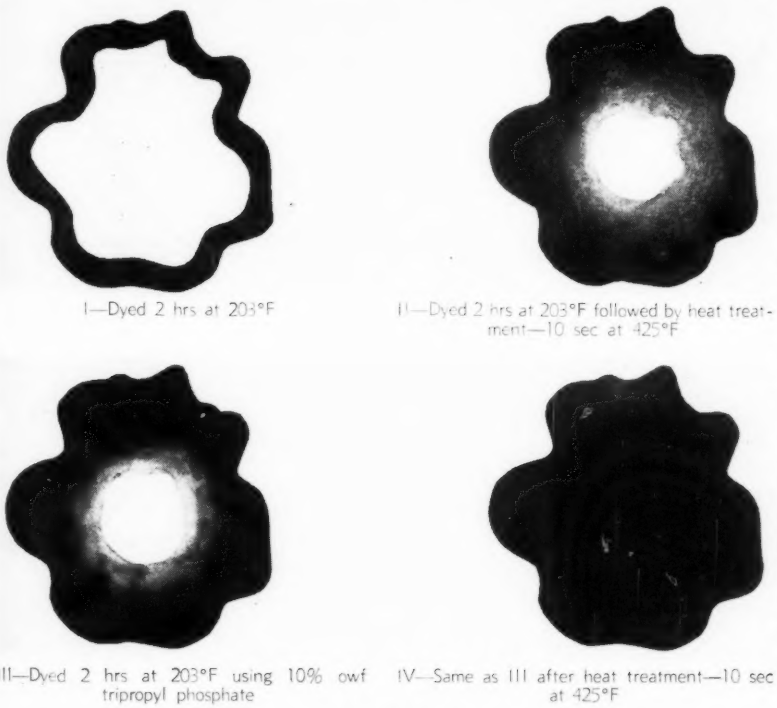

I—Dyed 2 hrs at 203°F
II—Dyed 2 hrs at 203°F followed by heat treatment—10 sec at 425°F
III—Dyed 2 hrs at 203°F using 10% owf tripropyl phosphate
IV—Same as III after heat treatment—10 sec at 425°F

Figure 2
Schematic representation of effect of accelerant and heat treatment on redistribution of dye (Eastone Red GLF) in Arnel fiber

alkalinities above pH 9.5, which is normal for many commercial washing and scouring baths.

Arnel triacetate has exceptional resistance to saponification under these same conditions. The relative rates of loss in combined acetic acid of secondary acetate, Arnel, and heat-treated Arnel are illustrated in Figure 3.

These curves represent the loss in percent combined acetic acid for the three fabrics scoured together at 95°C (203°F) for one hour intervals up to ten hours, adjusting the pH to 9.5-9.8 by the addition of caustic soda. The rate of loss of percent combined acetic acid on secondary acetate is rapid, whereas on the Arnel fabrics it is negligible.

This difference is further illustrated when the various samples are dyed with the direct rayon dye Pontamine Fast Pink BL (*CI* 353). Only the slightest staining occurs on the Arnel samples treated for 10 hours at pH 9.5-9.8, whereas the secondary acetate stains heavily after six hours and is dyed at 10 hours. The usefulness of the resistance of Arnel to saponification will be discussed further under mercerization and alkaline vat dyeing of Arnel/cotton blended fabrics.

DYEING PROPERTIES OF ARNEL ———Arnel, dyed under conditions which are standard for acetate, eg, 75-80°C with disperse (acetate) dyes, displays a dyeing rate intermediate between secondary acetate and Dacron. This is illustrated in Figure 4. Ten or 15 years ago this represented a serious economic disadvantage and created the impression that cellulose triacetate was difficult to dye.

The advent of the closed jig and winch with steam injection in the atmosphere made it possible to dye practically at the boil (95°C/203°F). Under these conditions Arnel can be dyed a wide range of light to medium shades with commercial exhaustion of dyes in three to six hours.

The effect of temperature on the dyeing rate is further illustrated in Figure 5.

Most laboratory and sample dyeings are carried out at relatively high liquor-to-fabric ratios up to 50:1. The curves in Figure 6 clearly indicate the decreased rate of exhaustion of disperse dyes as the liquor-to-fabric ratio increases. The use of dyeing accelerants or carriers increases the level of exhaustion, even at high liquor ratios, but their effect is particularly pronounced at the low liquor-to-fabric ratios of 5:1 to 15:1.

This phenomenon is further illustrated in Figure 7 from plant data obtained in jig dyeing of one- and ten-piece batches of Arnel fabrics representing 40:1 and 4:1 liquor-fabric ratios. The rate of exhaustion through an eight-hour dyeing cycle using 3% of Celliton Blue FFG was much lower for the 40:1 liquor ratio, although the use of 10% on the fabric weight of emulsified tripropyl phosphate did give a significantly faster dyeing rate than the control. At the 4:1 liquor ratio, using 10% tripropyl phosphate, a rapid and commercial exhaustion of the slow-dyeing dye was observed.

These observations clearly indicate why, even one year after Arnel became commercially available, dyers handling sample pieces at long liquor ratios still consider triacetate a slow-dyeing fiber.

ACCELERANTS OR CARRIERS——— In describing the dyeing properties of Arnel with disperse (acetate) dyes, we have touched briefly upon dyeing assistants, which greatly increase the rate of dyeing as well as the level of dye exhaustion. These have been interchangeably called "carriers" or "accelerants." This phenomenon has been observed and utilized on Dacron in the form of ortho- or para-phenylphenol, benzoic acid, methyl salicylate, trichlorobenzene, etc, containing commercial dyeing assistants. All of these materials also have the effect of increasing the dyeing rate on Arnel without the damage to the fiber which occurred when the ortho- and para-phenylphenols were used on acetate/Dacron blends. In addition, a group of materials have been isolated which are especially effective in increasing the dyeing rate on Arnel. Tripropyl phosphate is typical of this latter group. It requires careful emulsification to prevent spotty dyeing due to separation of the accelerant.

In addition to emulsified tripropyl phosphate, Emkalar DA and Cyanatex Dyeing Assistant A-1 have given excellent dyeing rates when employed under conditions of good bath stability. Figures 6 and 7 illus-

TABLE I
EFFECT OF HEAT TREATMENT ON FABRIC PROPERTIES

1) Increases size and/or perfection of crystallites.	1) Increases softening and melting point, improving ironing and glazing resistance. 2) Decreases moisture regain and increases drying rate. 3) Reduces swelling and shrinkage.
2) Relaxes stress in fibers and yarns introduced in textile processing.	1) Improves dimensional stability. 2) Improves wrinkle performance.
3) Increases diffusion of dyestuff from periphery into fiber.	1) Improves washfastness. 2) Improves gas fading. 3) Improves "O"-fading.

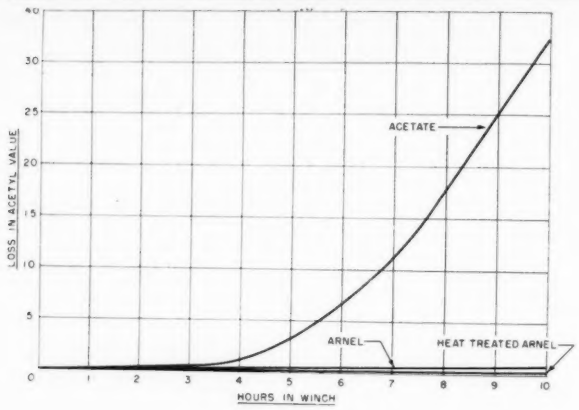


Figure 3
Rate of saponification at pH 9.5-9.8 and 95°C (203°F) under winch scouring conditions

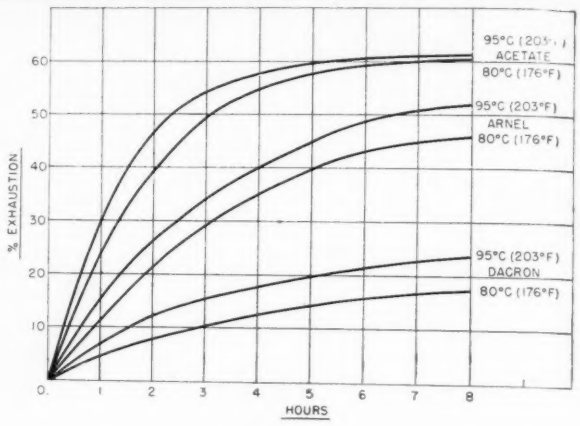


Figure 4
Relative dyeing rates of Arnel, acetate and Dacron with 2% Lenra Blue RLS at 50:1 liquor ratio

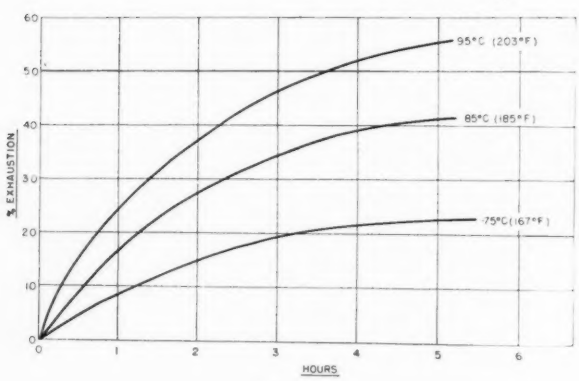


Figure 5
Effect of temperature on dyeing rate of disperse dyes on Arnel (2% Eastone Red GLF). Liquor-to-fabric ratio: 50:1

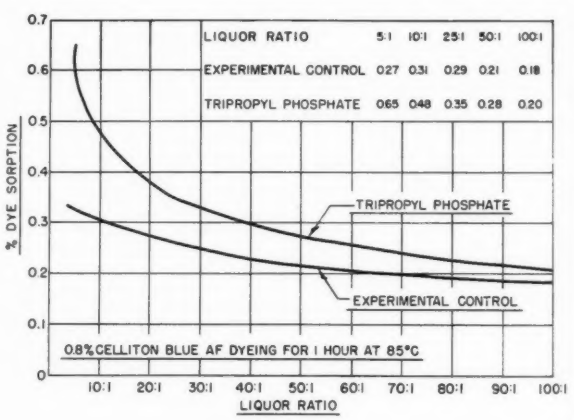

LIQUOR RATIO 5:1 10:1 25:1 50:1 100:1
EXPERIMENTAL CONTROL .027 .031 .029 .021 .018
TRIPROPYL PHOSPHATE .065 .048 .035 .028 .020
% DYE SORPTION
TRIPROPYL PHOSPHATE
EXPERIMENTAL CONTROL
0.8% CELLITON BLUE AF DYEING FOR 1 HOUR AT 85°C
LIQUOR RATIO

Figure 6
Effect of liquor-fabric ratios on dyeing rate

trate the influence of 10% of tripropyl phosphate on the rate of dyeing and level of exhaustion. Table II summarizes the useful effects of accelerants upon economical and balanced dyeing of difficult recipes. Figure 8 illustrates the effect of accelerant on increased penetration of dye into the fiber cross section.

JIG AND WINCH DYEING OF ARNEL IN A FULL RANGE OF SHADES ——The disperse (acetate) dyes listed in Table III were selected on the basis of optimum washfastness at the #3 AATCC test level (160°F), minimum sublimation at heat-treatment temperatures (425-450°F), and optimum light and gas-fading fastness. In addition, these dyes must have good bath stability at 200-212°F, economical exhaustion rates and pile-on, and response to accelerant action for heavy shades.

The range of shades and the level of balanced fastness properties, which may be achieved on Arnel under commercial dyehouse conditions, are illustrated in Table IV. These are the result of repeated full jig load dyeings with balanced recipes and the use of inhibitors and accelerants where necessary. Several of the heavy shades require a wash after heat treatment to improve the staining properties at the #3 AATCC washfastness level, as well as to stabilize shade and hand of the fabric.

TABLE II

EFFECT OF DYEING ACCELERANT IN JIG OR WINCH

1) Produces more balanced dyeing, since azo, diphenylamine and anthraquinone dyestuffs are all accelerated.
2) Permits earlier dye addition for shade matching, thus permitting dyeing of dispersed navies and blacks in 5-6 hours.
3) Increases penetration of dye into fiber, permitting achievement of optimum washfastness.
4) Permits use of less dye and results in greater percent dye exhaustion in commercial times.
5) Provides better control of initial dyeing rate or strike, thereby minimizing leveling difficulties.

Excellent whites are achieved on Arnel with soap, detergents, such as Igepon T, and the use of oxalic acid to remove metallic stains. Every available bleaching formulation has been applied to Arnel with no detectable harmful effect on fabric properties. Hydrogen peroxide and sodium perborate are the least effective bleaches. Peracetic acid, Textone (sodium chlorite), and sodium hypochlorite under acid conditions result in excellent bleached whites. On heat treatment even the best white is slightly yellowed due to decomposition of residual materials on the fabric. The optimum practice is to scour and heat treat the fabric and follow with a bleaching process.

Although blacks can be achieved with disperse dyes, their cost and fastness properties justify the use of developed azoic blacks on Arnel. If the slower rate of dyeing of Arnel is taken into account, excellent blacks based on such bases as Eastman Diazo Black SN, or Setacyl Diazo Black B and Developer BON (beta-oxy-

TABLE III

SELECTED DISPERSE DYES FOR ARNEL

Eastman Blue GLF	Latyl Blue BG
Lenra Blue RLS	Celliton Blue LAFR
Interchem Blue GSF	Nacelan Blue KLF
Cibacete Blue GLF	Nova Acetate Blue GSA
Latyl Blue FL	
Eastone Red GLF	Cibacete Red GGF
Eastone Fast Red 2BGLF	Interchem Scarlet GSF
Interchem Red GSF	Nova Acetate Scarlet GSA
Celliton Red GGLL	Acetamine Scarlet FL
Celliton Fast Red 6DAC	Eastone Fast Pink 3BGLF
Eastman Red NGLF	Celanthrene Violet BGF
Nova Acetate Red GSA	Eastman Violet 3RGLF
Nacelan Red 2G	
Lenra Yellow CW	Cibacete Yellow GWN
Lenra Yellow R	Nacelan Fast Yellow KAL
Interchem Yellow HDLF-40	Nova Acetate Yellow GSA
Celliton Fast Yellow GGLL	Nacelan Orange ARG
Latyl Yellow YL	Artisil Orange GFL
Eastone Fast Yellow 2RGLF	Amacel Orange BL (Heavy Shade)
Artisil Yellow RCGFL	Latyl Orange R

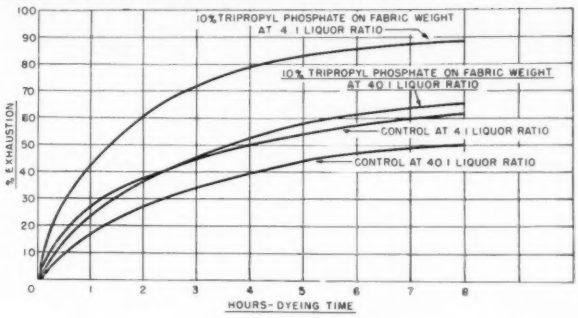


Figure 7

Effect of liquor ratio and dyeing accelerant on dyeing rate in jig on Arnel at 95°C (203°F) with 3% Celliton Blue FFG

naphthoic acid) are achieved on Arnel. The heat-treatment step usually brings a small quantity of the uncoupled diazotized base to the fabric surface, resulting in a bronzing appearance. A wash after heat treament removes this effect and results in a black of excellent fastness properties.

The pastel shades, which require a small amount of blue dye, present a double dilemma. If a gas-fast blue, such as Lenra Blue RLS or Eastman Blue GLF, is used without inhibitor, then "O"-fading *(3)* results in the bleaching out of the blue component. If gas-fading inhibitors are used which have been found to be effective on "O"-fading, then we have the danger of shade change due to yellowing of the inhibitor on exposure to the atmosphere. Such shades as turquoise, azure blue, minuet blue, cameo pink and desert sand require the careful use of co-dyeing inhibitor at the 0.5-1.0% level.

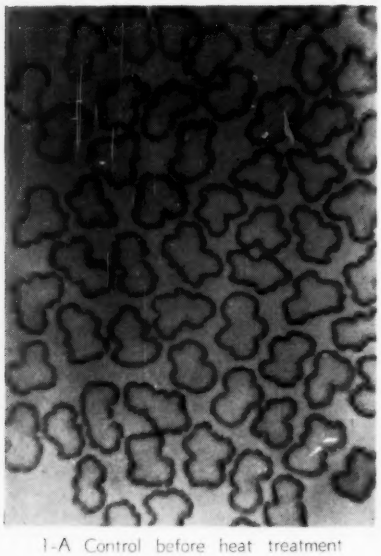
Many of the heavy shades, such as navy blue, chocolate brown and charcoal, respond effectively to the use of 5-10% owf of accelerant. In the jig, where very low liquor ratios are possible, the use of ac-

TABLE IV

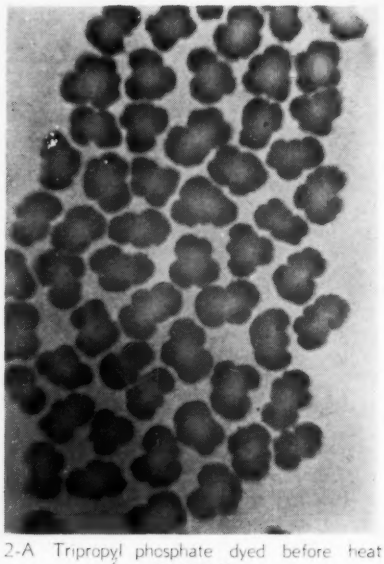
EXAMPLES OF ARNEL COLOR RANGE AND RECIPES

Shade	*Dyes**		*Gas Fading 2 Units*	*"O"-Fading 32 Hr*	*Light Fastness 20 Hr*	*Light Fastness 40 Hr*	*Comments*
Fire red	2.30% 0.52%	Eastone Red GLF Eastone Pink 3BGLF	4-5	4-5	4-5	4	Requires after-wash to reduce staining
Orchid	0.20% 0.01% 0.006% 0.004%	Eastone Pink 3BGLF Eastman Violet 3RGLF Eastman Blue GLF Interchem Yellow HDLF-40	4-5	4	4-5	4	Requires careful use of inhibitor to minimize "O"-fading and to prevent yellowing
Minuet blue	0.02% 0.0015%	Eastman Blue GLF Interchem Yellow HDLF-40	3-4	4	4-5	4	Requires careful use of inhibitor to minimize "O"-fading
Copper	1.8% 0.9% 0.6%	Eastone Red GLF Interchem Yellow HDLF-40 Eastman Blue GLF	4-5	4	4-5	4	Requires after-wash to minimize staining
Helio	2.00% 0.07% 0.30%	Celanthrene Violet BGF Eastone Red 2BGLF Eastone Pink 2BGLF	4-5	4-5	4	3-4	Accelerant useful in dyeing
Charcoal	1.80% 0.55% 0.80%	Eastman Blue GLF Eastone Red GLF Interchem Yellow HDLF-40	4-5	4	4-5	4	Accelerant useful in dyeing
Olive	4.5% 1.0%	Interchem Yellow HDLF-40 Eastman Blue GLF	4-5	4	4-5	4	Accelerant useful in dyeing
Cocoa	0.90% 0.75% 1.20%	Eastman Blue GLF Eastone Red GLF Interchem Yellow HDLF-40	4-5	4-5	4	4	Requires after-wash to minimize staining; accelerant useful in dyeing
Burgundy	1.00% 1.10% 0.55% 0.01% 0.02%	Eastone Pink 3BGLF Eastone Red 2BGLF Eastone Red GLF Interchem Yellow HDLF-40 Eastman Blue GLF	4-5	4-5	4	3-4	Requires wash after heat treatment to reduce staining
Seaspray	0.14% 0.023%	Latyl Blue BG Interchem Yellow HDLF-40	4	4	4-5	4	Requires careful use of inhibitor to prevent yellowing
Navy	4.0% 0.6% 0.4%	Lenra Blue RLS Interchem Yellow HDLF-40 Eastone Red GLF	4-5	4-5	5	4-5	Requires after-wash to reduce staining; accelerant useful in dyeing
Black	Developed black 7.5% Eastman Black SN 5.0% Developer Bon Concurrent process scour after heat treatment		5	5	5	4	Requires wash after heat treatment to remove yellowing by-products

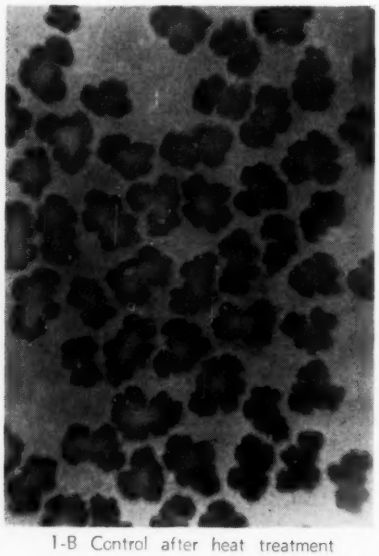
* See *1955 AATCC Technical Manual and Year Book*, Part V, for *Colour Index* numbers or Prototypes.



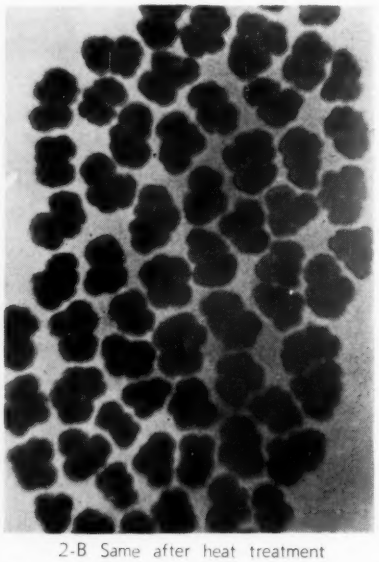
1-A Control before heat treatment



2-A Tripropyl phosphate dyed before heat treatment



1-B Control after heat treatment



2-B Same after heat treatment

Figure 8
Effect of accelerant and heat treatment on Eastone Red GLF distribution

celerants provides the basis for several useful effects listed in Table II. The accelerants also make possible the more effective use of dyes with poor pile-on, such as Latyl Blue BG, for the achievement of critical blue green shades, such as azure and peacock blue.

It should be noted that there is absent from the list of selected dyes in Table III an economical gas-fast blue for navies, a green blue of good gas fastness, and a bright orange or a lime yellow of good light and wash fastness. The addition of such dyes to the available list will further simplify the task of providing a full range of shades on Arnel.

DYEING OF ARNEL BLENDED FABRICS———It has become standard practice to blend two or more fibers or to combine yarns of two or more separate fibers to achieve a wide variety of aesthetic and functional properties in fabrics. It is increasingly evident that the textile industry is seeking to use the best properties of each of the fibers to construct fabrics of optimum performance and styling for the price level and end use.

In the first year of the Arnel program, numerous blends and combination fabrics have been constructed of Arnel with cotton, rayon, wool, nylon, Dacron, and the acrylics. Each combination of fibers presents a separate set of problems in the achievement in reserve, cross, and union-dyed shades of optimum color fastness.

Greatest advance has been made in the dyeing of blends with cotton, rayon and wool.

ARNEL BLENDS WITH COTTON AND RAYON———During the past ten years acetate/rayon blends have been established in important commercial fabrics. A class of direct dyes has been developed for rayon and cotton, which are capable of being aftertreated with copper complexes, with cationic fixatives, and with cross-linking resins. These may be applied to Arnel blends with the cellulosic fibers using the same techniques found to be optimum for acetate and rayon blends.

A typical process for union dyeing Arnel and cotton or rayon is to follow the same procedure outlined for dyeing the Arnel using the selected disperse dyes listed in Table III and the selected fixable direct dyes, examples of which are given in Table V. Where salt is required to improve the exhaustion of the direct dye onto the cotton or rayon, this salt addition should be made well along in the dyeing, since many of the disperse dyes, especially the anthraquinone gas-fast blues, tend to conglomerate in the presence of salt, resulting in surface color crocking. In addition, salt tends to decrease the stability of emulsified dyeing accelerant which may "oil out."

The copper and cationic fixatives may be applied in a final rinse bath because of their substantive nature on the cellulosic fibers. To obtain maximum washfastnesss of the fixed direct dyes, it is essential to apply a small quantity of urea-formaldehyde or melamine-formaldehyde resin, 2-5% solids on the weight of the cotton or rayon, after the heat treatment. This low percentage of resin is primarily to fix the color, since most of the Arnel blended fabrics containing up to 40% cotton and rayon are relatively stable to shrinkage and have improved wrinkle performance due to the properties of the Arnel component.

The resistance of Arnel to saponification provides the basis for economically processing Arnel/cotton blended and combina-

TABLE V
FIXABLE DYES FOR COTTON*

Cuprofix Yellow GL
Chlorantine Fast Yellow 2GLL
Solophenyl Violet 4BL
Cuprofix Blue LUL
Chlorantine Fast Blue BCL
Chlorantine Fast Blue 7GLL
Cuprophenyl Navy Blue RL
Solophenyl Dark Green GBL
Chlorantine Fast Gray GRL

* See *1955 AATCC Technical Manual and Year Book* for *Colour Index* numbers or prototypes.

TABLE VI

VAT DYES WHICH GIVE A MINIMUM OF STAINING ON ARNEL IN ALKALINE SOLUTION*

Calcoloid Blue BLD Double Powder
Indanthrene Navy Blue GN Paste
Indanthrene Blue CLN Infra Paste
Indanthrene Violet FFBNA Paste
Indanthrene Red FBBA Paste
Indanthrene Scarlet 3GA Paste
Indanthrene Red RK
Calcosol Scarlet B Paste
Indanthrene Brilliant Pink RN Paste
Indanthrene Golden Orange 3GA Paste
Ponsol Yellow 5GLL Paste
Calcosol Yellow GL Paste
Ahcovat Yellow 4G Paste
Ahcovat Flavone GCN Paste
** Ahcovat Green 7G Paste
Ahcovat Olive R Paste
Indanthrene Brown RA Paste
Ponsol Red Brown 5R Paste
** Ahcovat Direct Black AC

* See *1955 AATCC Technical Manual and Year Book* for *Colour Index* numbers or prototypes.

** Only for use in pigment pad jig reduced method.

tion fabrics under cotton dyehouse processing conditions. A typical process for vat dyeing the cotton and reserving the Arnel involves the following steps:

1) Singe, desize and scour
2) Heat treat to reduce staining
3) Mercerize cotton component
4) Pad vat pigment and jig reduce, or pad vat pigment and Williams Unit reduce
5) Oxidize and strip surface dye.

The vat dyes which give the least staining of the white Arnel component are those which are "cold dyeing" or easily reduced vats. Table VI contains a preliminary list of vats which give the least staining on the Arnel.

Under typical alkaline jig-vat reduction conditions using 1.5 oz caustic soda per gallon, 2 oz hydrosulfite, and Indanthrene Red RK at 50°C, secondary acetate was found to stain heavily in ten minutes and to dye in 30 minutes. Under these same conditions heat-treated Arnel was unstained in 90 minutes, and unheat-treated Arnel, only slightly stained. This critical comparison confirms the resistance of Arnel to saponification and represents a clear advantage of Arnel in providing an economical basis for the achievement of many color-styling effects in Arnel/cotton fabrics, which can only be obtained with more expensive beam, skein, or package dyeing of yarn.

DYEING OF ARNEL/WOOL BLENDED FABRICS——For most shades on Arnel/wool, a three-bath dyeing procedure is necessary at present in order to achieve best possible color-fastness properties. The three recommended steps are:

1) Dyeing of Arnel with accelerant which will reduce disperse-dye stain on wool.
2) Clearing disperse-dye stain from wool; if the stain is not removed, the color-fastness properties, especially to light, of the finished fabric will be lowered.
3) Dyeing of wool with fast dyes, such as selected acid or premetalized acid dyes.

General Recommendations——The pH of the first dyebath should not be acidic, but preferably neutral in order to further reduce staining of the wool component.

Latyl Blue BG and Celliton Fast Blue FFG are suitable for most shades requiring a blue component. These dyes have been found to stain wool least, with the Latyl Blue BG being superior to the Celliton Fast Blue FFG.

Three-step procedure —— This procedure is illustrated by the following dyeing formulation and method for producing a blue green/black shade on a 50/50 Arnel/wool fabric.

1st bath—Dyeing of Arnel
Prepare bath with
Interchem Blue ALF-40 and Interchem Yellow HDLF-40
10% owf Emkalar DA (accelerant).
Dye for four hours after 205°F has been reached at pH 7.5-8.0.

2nd bath—Clearing of wool
Treat fabric in
1 g/l soap
1 g/l Tamol N.
Clear at 120-130°F for 30 minutes.

3rd bath—Dyeing of wool
Dye with
4% owf Omega Chrome Blue-Black RZN.
Start at 80°F.
Raise to 160°F and add 10% owf Glauber's salt and 5% owf acetic said.
Raise to boil over ¾ hour, add 1% formic acid and run 30 minutes at boil.
Cool bath to 160°F and add 3% owf of sodium bichromate and boil ¾ hour.
Rinse.
(The required inhibitor, such as 1% Conco Inhibitor FR or Antifume AC, may be added in 3rd bath or in rinse at 150°F —30 minutes.)

NOTE: In the 3rd step, the wool could be union dyed or otherwise colored, as desired.

Two-Step Procedure (one bath)——In some shades it may be found that a negligible staining of the wool occurs in the first bath. Since clearing of the wool is therefore not necessary, the required wool dyes may be added to the same (or new) bath.

This method is illustrated by the following procedure for producing a rhythm blue on 67% Arnel/33% wool fabric.

Dye at pH 7.5-8.0 with
1.8% Latyl Blue BG
0.5% Eastman Violet 3RGLF
0.23% Interchem Yellow HDLF-40
0.04% Eastone Red GLF
10.00% tripropyl phosphate owf emulsified 8:1 with Emulphor ELA-719
1 g/l Igepon T
1% Permalene AF (inhibitor).
After dyeing for 3 hours at 205°F, the wool is not materially stained. At this point the following are added to the cooled bath (or a new bath if preferred):
0.4% Brilliant Alizarine Milling Blue BL
4.0% Glauber's salt
5.0% ammonium acetate
Raise temperature to 190-200°F and dye for about one hour or until match is achieved.

The two foregoing dyeing procedures produced the following color fastness properties:

Gas—very good (5 at 2 cycles)
Light—5 at 40 hours
Perspiration—good
Washing Test #2—good
Drycleaning—good

A list of typical selected wool dyes is recorded in Table VII.

DYEING OF ARNEL/NYLON BLENDS——In dyeing Arnel/nylon blends, it should be noted that the wash fastness of disperse dyes on Arnel is better than that of the same dyes on nylon. When dyeing Arnel/nylon blends, every effort should be made to get as much of the dye on the Arnel as possible. This can be accomplished by the use of accelerants, which provide a rapid exhaustion rate on Arnel. In cases where a higher degree of wash fastness is needed, the disperse dye may be stripped from the nylon and then color added by overdyeing with acid or premetalized dyes. The azoic disperse dyes can be easily cleaned off nylon with a hydrosulfite stripping without affecting the shade of the Arnel.

Anthraquinone-type disperse dyes (Eastman Blue GLF) are not as easily stripped from nylon as the azoic dyes. The use of active accelerants, such as Emkalar DA or Cyanatex Dyeing Assistant A-1, greatly facilitate the selective exhaustion of dis-

TABLE VII

RECOMMENDED DYES FOR ARNEL/WOOL BLENDS*

(Selected for best possible perspiration, light and wash fastness)

NEUTRAL DYEING PREMETALIZED ACID DYES

Cibalan Blue BL
Cibalan Brown 2GL
Cibalan Gray BL
Cibalan Scarlet GL
Irgalan Yellow RL
Irgalan Bordeaux 2BL
Irgalan Orange RL
Cibalan Red 2GL
Cibalan Green GL
Cibalan Violet RL
Cibalan Brilliant Yellow 3GL
Cibalan Corinth BL

METOMEGA CHROME DYES

SIMULTANEOUS DYEING AND CHROMATING WITH METOMEGA CHROME MORDANT

Metomega Chrome Blue 2RL (for navies)
Metomega Chrome Yellow ME
Metomega Chrome Orange ML
Metomega Chrome Brown RLL (for dark brown)
Metomega Chrome Green GL (for dark green)
Brilliant Alizarine Milling Blue G (for light-to-medium blues)
Brilliant Alizarine Milling Blue BL (for light-to-medium blues)
Alizarine Light Grey BLL (for light-to-medium greys)
Metomega Chrome Red GM (Preferably used only as shading color; stains Arnel slightly)

* See *1955 AATCC Technical Manual and Year Book* for *Colour Index* numbers or prototypes.

perse dye onto the Arnel component.

A typical dyeing and finishing procedure for producing a navy blue on 85% Arnel/15% nylon (winch dyeing):

1st bath
Dye at 205°F for 3-4 hours
4.0% Celliton Fast Blue FFG (or Lenra Blue RLS)
1.0% Eastone Fast Red GLF
0.5% Interchem Yellow HDLF-40
8 g/l Emkalar DA
4 g/l Emkatex 49-P
(In some baths, agents such as Tamol N, Quaker 2700, and soda ash may be added to reduce crease marks. Other additions should be checked for compatibility before using.)
Rinse.

2nd bath
Wash in
5 g/l Rexopon V
1 g/l soda ash.
for 30 minutes at 160-180°F.
With some shades the nylon portion may be satisfactorily cleared. If not, a clearing with the following should be satisfactory:
1% owf sodium hydrosulfite
1% owf Emulphor ELA-719
at 150°F for 20 minutes.

3rd bath
Dye nylon at 205°F for one hour with
2.5% Cibalan Blue BL
1.0% Irgalan Red 3G
0.5% Irgalan Yellow GL
0.5% ammonium acetate (on weight of nylon)
Rinse as usual adding 2% Antifume AC to hot rinse.
Cold rinse.

Finishing
Dry on clip tenter.
Dry fill on clip tenter with
15 g/l DeCetex 104
30 g/l DeCetex 108
5 g/l Syton W-20
5 g/l Catalyst XEY-16
Heat treat fill at 410°F, 25 ypm.
Return to winch and wash in ¼-½ g Emulphor ELA-719 one hour at 75°C.
Take out of rinsing bath with 1000 g Ahco 111 as nondurable antistatic agent.
Airlay dry.
Steam to width on short frame and decatize.

DYEING OF ARNEL/DACRON BLENDS———The practice in the dyeing of the Arnel/Dacron is to use the very best colors for Dacron, dyeing with a carrier based either on methyl salicylate or orthophenylphenol and then washing down such dyes as Celanthrene Cerise B and Celliton Yellow 4RL from the Arnel, on which they have poor wash fastness. The Arnel is then shaded up with recommended disperse dyes for Arnel using tripropyl phosphate, which is an accelerant only for the Arnel.

A typical example of dyeing a Navy on 70/30 Arnel/Dacron is as follows:

1st bath
Dye at pH 7
3.0% Lenra Blue RLS or 6% Interchem Blue GSF
1.0% Celanthrene Cerise B
0.4% Celliton Fast Yellow 4RL
5 g/l orthophenylphenol
5 g/l diammonium phosphate
1 g/l Igepon T

Cleaning
Clean with
Tamol N or Emulphor ELA-719
1 g/l at the boil for 20 minutes

2nd bath
0.3% Eastone Red GLF
0.1% Interchem Yellow HDLF-40
1.0% Celliton Fast Blue AF (does not dye Dacron under these conditions)
10% tripropyl phosphate emulsion
2% inhibitor for blue dyes

HEAT TREATMENT PROCESSES———The importance of a proper heat treatment of the Arnel-containing fabric has been summarized in Table I. In general, the essential conditions for effective treatment require that the fabric temperature be raised to at least 425°F as uniformly as possible across the width and through the depth of fabric with a minimum of distortion due to tension or nonuniform air currents. Although several useful improvements in properties are achieved at temperatures in the range of 400-410°F, such as stability to shrinkage, resistance to gas- and "O"-fading, and decreased staining in washing, fabric temperatures as high as 450°F are required to give maximum resistance to glazing and ironing.

A number of commercially available systems developed for the heat setting of nylon and Dacron fabrics have been found to be readily adaptable to the processing of Arnel fabrics.

HOT ROLL AND CAN SYSTEMS———The *Morrison 2-Roll Machine* built by the Morrison Machine Co., Paterson, N J, under patents held by the Fair Lawn Finishing Co, provides a versatile means of processing a large variety of Arnel fabrics. It consists of two large hollow cans, 60-70 inches wide, in an enclosed housing. Heat is supplied from hot combustion gases blown through the hollow cans as well as onto the fabric face, which contacts the can surfaces on one side only. The fabric is fed into the heated chamber under minimum tension and threaded so that the exit takeup roll is on the same side as the entrance.

Uniform temperature distribution is achieved on fabrics put through at sufficiently slow speeds. Each fabric weight and construction will require a preliminary set of trials to achieve optimum air temperature and fabric speed. Thus, a lightweight continuous filament fabric will require an air temperature of 435°F and a fabric speed of 35 ypm, whereas a heavier spun fabric requires an air temperature of 450°F at 20 ypm.

On the Morrison 2-can system, spun fabrics tend to shrink up to 5% in width, and preframing of the fabric to compensate for this may be required if the desired end-fabric width is critical. In addition, Arnel, under heat treatment conditions, tends to stretch easily, and careful tension control is required to prevent excessive warpwise stretch. The presence of cotton or rayon in blends or combination yarns with Arnel decreases the tendency of the fabric to stretch.

Various modifications of the enclosed hot-gas-heated-can systems are available and can be adapted to use on Arnel. One advantage of contacting the fabric on only one side is that the outer face of flannels, twills, and ribbed fabrics is not polished, ironed, or glazed during heat treatment.

The *National 6-Roll Machine* developed by National Drying Machinery Co, Philadelphia, Pa, consists of six horizontal internally gas-fired steel rolls, 66 inches wide and about 15 inches in diameter, forming a vertical bank. The rolls are hollow, filled with Dowtherm A as the heat-transfer medium, and can be operated continuously at a surface temperature of as high as 500°F.

The dry fabric is fed to the bottom roll under controlled tension and contacts each of the six cans up the ladder on alternate fabric faces. Fans and/or a cooling can are used to cool the fabric before it is rerolled. The same precautions as indicated for the Morrison 2-can machine are required to minimize warpwise stretching and widthwise shrinkage.

A wide variety of *hot-gas-heated clip and pin frames* are available, capable of attaining 500°F gas temperature. While this is sufficient to raise the Arnel fabric temperature to the desired level, most fabrics, especially spun constructions, come out badly stretched and distorted due to the turbulence and unbalanced top and bottom gas currents. Although to date it has not been possible to find such a frame capable of giving a completely satisfactory heat treatment on a wide range of fabrics, this approach has much promise. The use of preheaters, steam injection into the hot gas atmosphere, and better balance of air flow should provide a basis for the use of existing frames.

Radiant heating panels have been installed at the exit end of a 90-foot Morrison pin frame at the Hopewell, Va, plant of the Celanese Corporation of America. This unit consists of twelve 60-inch long panels mounted above the pin frame and fourteen panels mounted below the frame, both sets on retractable carriages to remove the heat source when the fabric stops moving. Additional single panels are mounted over each fabric selvedge parallel to the direction of the fabric movement to permit balanced heating of the edges. Panel surface temperatures up to 900°F are required to heat the fabric to 400-450°F. Much more attention must be given to proper adjustment of panel distribution and prevention of cold air currents on this machine than

(Concluded on page P105)

1955 National Convention——

PRESSURE DYEING AND DRYING IN A CLOSED SYSTEM AS COMPARED TO DYEING AND DRYING IN AN OPEN SYSTEM*

F THIES

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The author deals primarily with the drying of cross-wound packages.

Following a brief consideration of the package itself, he discusses drying methods employing tray dryers and hot-air circulation dryers of the open and closed types, listing advantages and disadvantages of each system. A new, high-pressure, closed circuit dryer is covered in detail.

The latter part of the paper deals with the dyeing of packages under static pressure.

INTRODUCTION

SOMETIMES one cannot help being under the impression that, although there is a general tendency to increase textile production, little thought has been given to the question of textile *drying*, which —and I am sure you will agree with me —can be a most important factor in the quality of the finished fabric and in its manufacturing cost. In the course of this lecture I will deal primarily with the drying of cross-wound packages.

DRYING OF CROSS-WOUND PACKAGES

CONSIDERATION OF THE PACKAGE———Let us first examine the package itself, which requires careful consideration. Because of the construction and form of the yarn, it is difficult to bring it into direct contact with the drying medium. Thus it is extraordinarily difficult to make use of any kind of heat radiation, since this will only heat up the outside layers of yarn. The center, however, is completely insulated and, therefore, the only way to get it dry is to wait for the moisture to migrate slowly to the package surface where evaporation takes place. The smaller the surface of the package in relation to its weight, the longer the moisture takes to migrate from the center to the outside of the package and so evaporate. Consequently this difficulty applies particularly to heavy packages, and, as the tendency today is to use larger packages having a large yarn volume, the problem is an acute one.

TRAY DRYERS———A drying method of this kind is still in use today, that is, the drying of cross-wound packages in so-called tray dryers. Originally this process was used for hank drying, for which it was eminently satisfactory. After dyeing, the hanks were hydro-extracted in the centrifuge and subsequently hung in the drying chamber. The tray dryer is an improved design of this drying chamber. In this machine heat energy is fed to the yarn by circulation of air, which is subsequently blown out after being saturated with moisture. As the circulating air is in contact with most threads, this method works well for the processing of hanks, but it is far from ideal when packages have to be dried. The reasons for this are: *first*, the area of the package exposed to the drying medium is very small so that the moisture has to migrate slowly from the inside to the outside of the package, and *second*, an excessive amount of handling of the packages is required. The packages have to be removed from the dyeing carrier, loaded into a centrifuge and finally put in the drying chamber. In this connection I should also like to point out that centrifuge-type hydro-extractors have mostly limited capacities, and processing in this machine causes the packages to become damaged and misshapen. Furthermore, compared with the drying system where hot air is blown through the packages, it is much more difficult to control the drying process satisfactorily in the tray-type dryer.

HOT-AIR CIRCULATION DRYERS———When packages are dried by the hot-air circulating system, the normal procedure is to dry them on the same carrier used for dyeing. In this process the package is wound on a perforated tube, which allows the passage of air from the inside to the outside or in the reverse direction. On this special dryer the hot air is blown through the packages, leaving the heat in the package center. Although the circulating system has many advantages over the hot-air drying chamber, there are still some very serious disadvantages connected with it. Above all, it is absolutely necessary to filter the drying air, otherwise all the dirt from the atmosphere is filtered into the inside of the package, particularly in industrial areas.

For a satisfactory and successful drying, it is essential to fit a filter to the suction side of the blower, and this filter must be even finer than the very fine filter formed by the yarn layers of the package. Apart from that, it must be borne in mind that the air varies with the actual climatic and weather conditions, such as temperature and humidity. The only way to supervise the drying is to control the inlet temperature, ie, the temperature of the air going into the packages, and the outlet temperature, ie, the temperature of the air leaving the packages.

This system works as follows: The air is sucked in from outside through a filter and blown through a heating battery by a fan. The hot air is then forced through the packages and finally blown out into the open air. It is possible to control the temperature of the air going into the packages and also the air coming out of them. The end of the drying process can be gauged by the difference in temperature between inlet and outlet. There can be no influence, of course, on the moisture content and the temperature of the air being sucked in.

Actually, there are two different types of dryers in which the air is blown through the material to be dried, namely, the open- or port-type dryer and the closed-type dryer.

OPEN-TYPE DRYER———The open- or port-type dryer takes several carriers at a time and dries them simultaneously. The capital outlay for such a machine is not very high, but to make full use of it, quite a number of carriers are required because the drying times are relatively long. Another disadvantage of the port dryer is that the hot air coming out of the

* Presented by J E Butterworth, Jr, H W Butterworth & Sons Co, Bethayres, Pa, for the B Thies Co, Coesfeld, Germany before a Symposium on Dyeing and Finishing held September 24, 1955 in the Viking Room, Haddon Hall Hotel, Atlantic City, N J. In advisory capacity was William Eikoetter.

packages is not blown into the open air but remains in the dyehouse. This is most unpleasant, particularly in summer. However, as far as the air circulation is concerned, this drying method is ideal, enabling the small orifices in the carriers, spindles and tubes (which were originally designed for liquor circulation) to be used for the circulation of a relatively small quantity of air.

CLOSED-TYPE DRYER———To reduce the space required for dryers of this design, as well as to reduce the length of the drying periods, the closed-type dryer, which takes only one carrier, was designed. As a matter of fact, the drying periods had to be reduced considerably to obtain the highest possible production because only one carrier was dried at a time. The only way to reduce the drying time was to feed the largest possible amount of heat energy to the packages. This could be achieved by increasing the temperature of the air passing through the packages and by increasing the amount of air circulated through the packages to be dried.

If the inlet temperature is increased by 50°F, the drying time is reduced by about 12%. This applies to temperatures between 212 and 284°F. The only other way to obtain a shorter and more economical drying time is to increase the amount of air circulating through the carrier and packages. The drying temperature must not exceed a certain figure, of course, otherwise serious damage to the fibers will take place.

As already mentioned, the dyeing carrier and also the cross-wound packages are intended for wet processing, and the package carrier is, of course, designed accordingly as far as the diameters and the resistances are concerned. The circulation of a large quantity of air would require larger diameters, which are not satisfactory for dyeing because of the increased liquor ratio. Thus a large amount of air has to be blown through the carrier with unfavorable flow conditions, giving rise to uneconomical use of electric power required for the blower. The power required increases by the cube with the resistance offered by the packages. In practice, a ratio of about 0.4 to 0.5 HP per kilo of yarn is permissible. Beyond that it hardly will be possible to obtain a further reduction of the drying time while still remaining within economic limits.

From this it can be seen that the temperature of the air flowing through the packages cannot be raised as much as desired; also, the possibility of feeding more heat energy to the packages by increasing the blower capacity is, of course, limited. The actual drying times which can be obtained on an industrial basis with normal cotton packages of 26.5 ounces are between 60 to 90 minutes approximately, according to the winding density and the type of yarn used. These concrete figures refer to cotton only, as this is the fiber which is most widely used. The figures for other fibers, such as wool, spun rayon or synthetics move in the scale which applies to such fibers and have relation to the cotton figures.

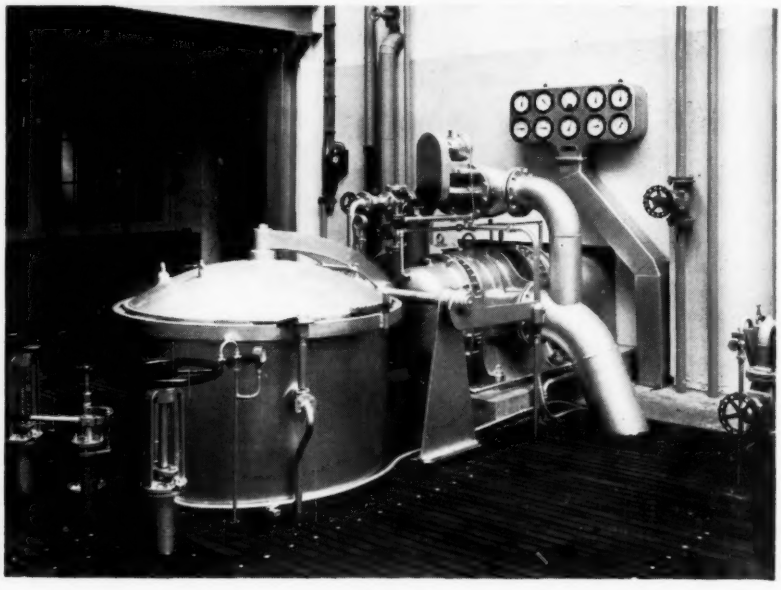

Figure 1

HIGH-PRESSURE CLOSED-CIRCUIT DRYER———Based upon the fact that the more heat energy fed to the packages, the shorter the drying time, a new and completely closed drying system has been designed. This consists of the usual items, ie, a blower, a heating battery and a completely closed drying kier. Furthermore, an indirect cooling device is fitted to the outlet of the drying kier, and from this a connection is made to the suction side of the blower. The air coming from the blower is heated up in the heating system, forced through the packages, and then passed through a cooling battery where it is cooled down and the moisture separated. By controlling the rate of flow of the cooling water in the cooling battery, more or less moisture can be left in the air for recirculation.

Figure 1 shows a standard high-pressure closed-circuit dryer with the drying kier in the forefront and the combined air heating and cooling units in the background. This picture was taken in our own dyehouse, where we have complete facilities to dye and dry yarn lots of 250 pounds each under actual production conditions.

By this design it was found that the drying time was greatly reduced, because it was possible to subject the whole closed circulation to a static pressure before the drying process was started. The blower circulates a certain amount of air, exactly as at normal atmospheric pressure. This quantity of air, however, has a multiple heat absorption capacity. As the heat energy is proportional to the weight of the air, four times the amount of heat energy can be fed to the packages with the same quantity of air at a pressure of 32 psi than at normal atmospheric pressure. At the actual working pressure of 85 psi, which we use, the same amount of air contains 8 times more heat energy than at normal atmospheric pressure; however, the drying periods are not reduced in the same proportion as the heat absorption capacity of the air is increased. For instance, at a static pressure of 32 psi with the blower output and other working conditions remaining unchanged, the drying time can be halved compared with a drying process carried out under normal atmospheric pressure. With a pressure of 85 psi the drying time can be reduced to one-third.

The effect of static pressure on drying time can be observed readily in Figure 2. I would like to mention here that this graph was prepared by one of our development engineers, who used as the subject of his thesis for graduate work the relationship between static pressure and drying time. The graph is in the form of a cube with a section scooped out. It is thus possible to give a three-dimensional effect to it. Drying time is measured on the vertical lines of the cube, static pressure is measured on the horizontal lines outlining the front and rear faces of the cube, and air quantity per

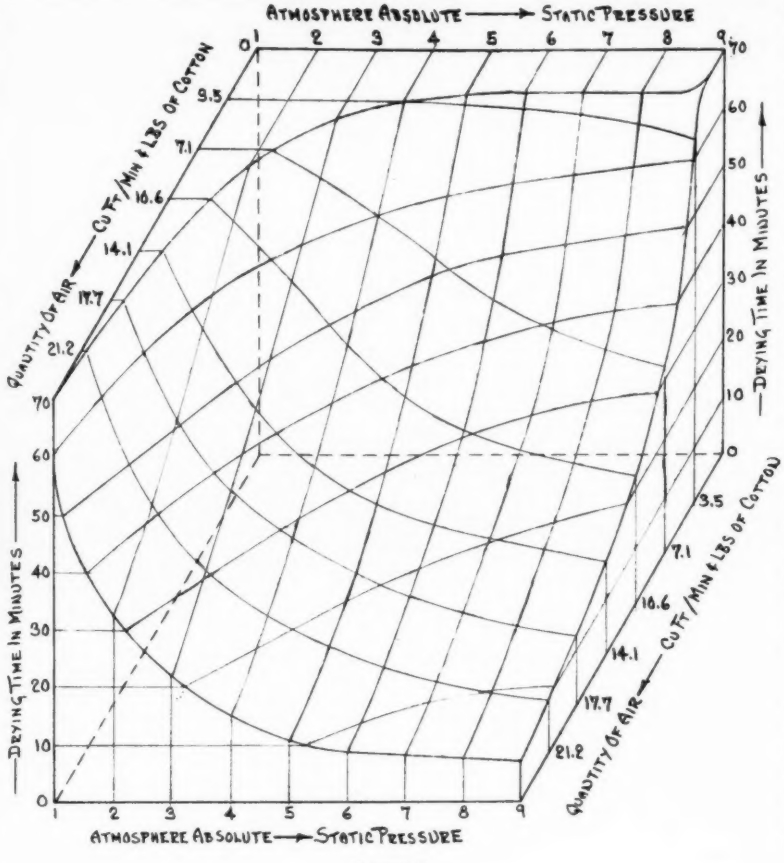

Figure 2

Drying time in relation to the static pressure and the quantity of air delivered. (Related δ = .075 lbs/cu ft). Inlet temperature = 140°C (244°F)

pound of cotton is measured on the horizontal lines giving depth to the cube. At a static pressure of 30 psi (2 ATU's) and 21.2 cubic feet of air per minute, 2.2 pounds of cotton yarn can be dried in approximately 43 minutes. By increasing the static pressure to 103 psi (6 ATU's) the same quantity of yarn can be dried in approximately 15 minutes. It is easy to understand that, with the same volume of compressed air circulated, the resistance offered by the carrier, spindles and tubes is increased only very little or not at all compared with the air circulating under normal atmospheric pressure, since, actually, the volume of air, and consequently the circulating speed of the air through the material, does not change.

When I said earlier that all other working conditions remained unchanged, I should have said "except for the moisture which enters the material," because in a closed system the air contains much more moisture than in an open-type dryer.

Another advantage of this closed-circuit drying system is that the amount of moisture being recirculated to prevent partial overdrying is, or can be, considerable. The quantity of moisture being recirculated through the packages can easily be controlled by the temperature to which the air coming out of the packages is cooled down. The more the air is cooled, the less moisture is recirculated; conversely, the higher the temperature of the air flowing back to the blower, the more moisture will be recirculated through the packages to avoid overdrying. This is very important in view of the fact that the packages vary in density, consequently more air can get to some parts of the package than to others. This means that some moisture will remain in the thicker layers of the packages while the middle part of a bobbin, which is penetrated more easily and consequently dried more quickly, could overdry if it were not for the recirculating moisture. To give further help, a four-way cock is fitted into the drying system so that the air can be circulated from inside to outside and vice versa.

The process works as follows: The air is circulated through the packages from outside to inside. Thus we not only obtain a thermal drying effect, but also a mechanical hydro-extraction to a remaining moisture content of about 70%. This can be obtained because of the high density of the compressed air. Subsequently, when the air outlet temperature is constant and evaporation starts, the four-way cock is reversed so that the air flow is then from inside to outside. This main drying process from inside to outside is continued until the gauge indicates a rise of the outlet temperature of the air coming from the packages. Then the four-way cock is reversed again and the final drying is effected with an air-flow from outside to inside to avoid an overdrying of the interior yarn layers and to have a better circulation of hot air through the edges of the packages. When the drying has reached its final stage, cooling of the air coming from the packages can be stopped so that more moisture is recirculated. This insures uniform drying and avoids any overdrying of the packages. Owing to the much larger amount of heat energy which is fed to the packages because of the compressed air in the unit, the average drying period is about 30 to 40 minutes.

Damage can be caused to the packages only if they are overdried, ie, if there is no moisture in them. In any case, it is not the drying temperature which has a decisive influence on the quality of the dried packages, but the moisture content. If the material contains much moisture, it can be dried at high temperatures. If the moisture content is rather low, the temperature has to be reduced or care must be taken that a sufficient quantity of moisture is always recirculated. This can be controlled by the temperature of the air that is delivered to the suction side of the blower. Needless to say, all these operations can be controlled automatically.

SUMMARY———From what I have said it follows that the actual form of a cross-wound package is not ideal at all for uniform drying. There is the possibility of overdrying a section of the individual package, since the middle part of the package can be penetrated more easily than, for instance, the edges. However, in the closed-circuit pressure-drying system, the drying can be controlled in all its stages, and at the very moment when the package is perhaps partially dry an overdrying can be completely avoided by recirculating moisture-laden air. This is a very important and outstanding feature of this dryer, which, because of very short drying periods, is indeed a most economical machine.

With other dryers the relatively hot air coming out of the packages is blown out into the open air. In the pressure dryer, however, the hot and saturated air passes

a condenser, and on its way through this unit gives its heat to the cooling water circulating in the condenser. This is recovered for further use. The heated "cooling" water may of course be used in the dyehouse for dyeing and also for rinsing purposes, or it may be recirculated into the hot-water system. Bearing in mind the reduced drying periods and the cost for steam and electric energy, it can be seen that the closed-circuit pressure dryer offers a saving of about 50% as compared with the circulating dryers which operate at atmospheric pressure and which discharge saturated air to atmosphere. For this reason we may say that the pressure dryer is an ideal machine for drying dyed, bleached and other cross-wound packages subjected to wet processing.

DYEING PACKAGES UNDER STATIC PRESSURE

I would now like to spend the remaining time allotted to me talking about the newest development in package dyeing; that is, the possibility of dyeing packages under a static pressure as distinguished from the normal type of pressure dyeing where the pressure is exerted by a pump on the inside or outside the package.

High-pressure and high-temperature dyeing are not as new as it may perhaps seem. There are quite a number of instances in German patent law covering processes and patents relating to dyeing under pressure or at high temperatures. I want to cite only some typical examples in this connection.

First, there was one Leon Detre who as far back as 1904 applied for a patent, which covered a unit that was set under pressure by means of gas. His application covered an expansion tank as well as a vessel for adding dyestuffs. The latter vessel was separate and could be included in the main liquor circulation when desired.

A further patent bearing the number 455,995 was issued to IG Farbenindustrie in 1924 covering a process for dyeing under static pressure. I would like to quote literally a paragraph from this patent, which contains the following limitation:

> "So far only such processes have become known under which textile fibers are treated with dye-liquor under a higher pressure and that in such a manner that the liquor in the closed apparatus is heated above the boiling point so that the pressure is produced by the steam of the dye liquor."

This wording shows clearly that the idea of a high-temperature dyeing apparatus was already in evidence at that time.

In recent times, the patent No. 749,136 issued to the firm of B Thies in 1942 deals with dyeing under static pressure. The characteristic feature of this high-pressure dyeing apparatus is an expansion tank, which can be disconnected from the circulation of the dyeing apparatus if desired, and which can be used simultaneously for adding dyestuffs and chemicals. Besides, this patent exhausts almost completely the possibilities of pressure generation, namely:

a) by the expansion of heated air;

b) by the admission of an additional pressure medium and finally

c) by a pressure pump which forces the liquor out of the expansion tank into the circulation, thus settling the unit under pressure.

In looking through the various textile journals, you undoubtedly have noticed many articles dealing with new developments in the field of high-temperature package dyeing. On one point all agree; that is, that high temperature dyeing for certain groups of fibers and colors is definitely of interest.

HIGH-TEMPERATURE DYEING APPARATUS———Now I should like to discuss the construction of high-temperature dyeing apparatus. I do not claim that the ones I describe are the only ones being built, but for the purpose of this talk they are divided into two main systems. One system I should like to call the high-temperature dyeing apparatus as distinct from the high-pressure dyeing apparatus.

The high-temperature apparatus consists of a completely closed expansion tank. The air contained in it expands at high temperatures, thus producing a static pressure corresponding to the temperature used. Thus the liquor is prevented from boiling at temperatures above the boiling point. It relies upon the recirculating liquor to produce the static pressure. Static pressure is built up only when temperatures near or above the boiling point are reached, and it is gradually increased by raising the temperature.

I believe that you will all agree with me that high-temperature dyeing does not solve all the problems that arise in the dyehouse. This is especially the case with vat colors. Only a very limited number of vat dyes are able to withstand temperatures near or above the boiling point. For all practical purposes the use of high-temperature dyeing with vat dyes is negligible.

The high-pressure dyejng apparatus differs from the high-temperature machine in that it operates under a predetermined artificial pressure, which sets the apparatus and the liquor contained therein under a predetermined static pressure. A separate pressure pump builds up the static pressure by forcing additional liquor into the system, which in turn compresses an air cushion in a small expansion tank, thus setting the complete system under static pressure. By the use of this same pressure-producing pump, it is possible to make additions of dyestuffs and chemicals during the dyeing process from an open or closed addition tank. The high-pressure dyeing machine is a combination machine in which you can dye under high temperature also.

We have found, not only in Europe but in the United States as well, that with the use of static pressure, production and quality are substantially improved. Rate of exhaustion, the liquor flow, as well as the length of the dyeing cycle are the major contributing factors for level dyeing. When static pressure is applied at normal vat-dyeing temperature, even penetration of the dyestuff into the fiber takes place in a considerably shorter time. The rate of exhaustion can be controlled by pressure also. We have found that, with a number of vat dyes, the controlled exhaustion of the dyebath under pressure develops a better color value in a shorter time. However, the application of pressure does not have equal effect on all vat colors as regards exhaustion. There are a few rapid-exhausting colors on which the exhaustion will be less at a higher pressure and greater at a lower pressure than under normal dyeing conditions. Furthermore, as the pressure is increased above a certain point, a resulting increase in exhaustion and levelness does not occur.

A very substantial saving in chemicals is possible with the high-pressure machine as compared with the conventional-type dyeing machine. The use of leveling or retarding agents can be eliminated or at least substantially reduced. An appreciable amount of saving can also be made in the use of hydrosulfite and caustic. Further, high pressure helps to eliminate so-called cross-overs, blown beams, and shading while at the same time improving the penetration of hard edges.

In concluding my remarks on the high-pressure dyeing machine, let me point out that it must be taken into account that, by a more rapid dyeing and a quicker exhaustion of the bath, a higher production can be obtained from the plant. Therefore, from the economic point of view only, the machinery will pay for itself in a short time.

Possibly some of you know of the Thies Plant. Our policy has always been to get the greatest possible output from a plant, and we, in our installations, provide for auxiliary machines to handle the auxiliary processes.

We feel that the stainless-steel high-pressure, high-temperature dyeing apparatus is far too valuable and expensive merely to carry out pre- or aftertreaments in it. By the installation of an after-treatment apparatus the dye kier can be left free for the dyeing process only, thus greatly increasing the production that can be obtained from the plant.

1955 National Convention——

CATALYSIS IN BLENDED CHEMICAL FINISHES*

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With the increasing trend to apply to textile fabrics a variety of chemical products in one finishing bath, the problem arises of properly curing or fixing all of the products in or on the textile fibers by use of the least number of catalysts. In some applications of blended thermosetting resins to cellulose fabrics, a single acid-yielding catalyst will properly cure all the resins on heating. With combinations of formaldehyde, nitrogen resins, ketone resins, hydroxylated polymers and cationic softeners with durable silicone- or resin-type water repellents it becomes necessary to use selected specific catalysts. In some cases, the specific catalyst for one of the chemical finishing agents may be antagonistic to the proper cure of a second finishing agent in the finishing mix. This is illustrated in the attempts to use an alkaline-catalyzed ketone resin with an acid-catalyzed urea- or melamine resin at the same time.

A greater problem arises in blends of chemically different finishing agents in that an ideal catalyst for one product may have very deleterious effects on fiber properties, dyestuffs, handle, etc, or may bring about odor, toxicity, or discoloration problems. A discussion is presented on the theory and mechanism of catalysis of various chemicals used by the textile-finishing industry with special emphasis on the practical problems facing the textile finisher if he is not warned of the specific nature of the products or the catalysts that are recommended for his use.

INTRODUCTION

IN the manufacture of most textile fabrics, the natural properties of the fibers and the geometric arrangement of the yarns and the weave do not always lead to all the desirable properties demanded for a particular end use of the material. Consequently, in order to improve, modify, or introduce new functional properties in a textile material a host of natural and synthetic chemical products are available as finishing agents. One of the most important generic classes of such agents comprises products which are rendered insoluble or infusible by heat treatment, after application to textile materials. This class of heat-setting or chemically reactive substances includes the species of: formaldehyde-nitrogen base monomers or condensates; mono- and dialdehydes along with their alkyl acetals; ketone-aldehyde resins; unsaturated aldehyde-formaldehyde condensates; methyl-hydrogen-silicone polymers; polysiloxanes; resin base-fatty acid derivatives; polyamine-polyamide metal complexes; metastable quaternary ammonium compounds; and some newer types of nonnitrogenous, nonformaldehyde fiber-reactive monomers. Within each of these species, there are numerous individual compounds or resinous products which are now commercially used in textile finishing operations.

In the largest number of products, the mechanism of heatsetting or curing to an insoluble, infusible state involves condensation reactions, ie, two or more molecules of the finishing agent react with each other and a small molecule is eliminated. This is shown in Table I.

In most cases, the by-product is water or a low-boiling alcohol. In a second type of condensation, the finishing agent may react with one active hydrogen group of the fiber polymer, but the same by-products are eliminated. In the most common cases, both intermolecular condensation and reaction with the fibers occurs if the fiber contains active hydrogen groups. In some cases of condensation reactions, the by-products of cure may be compounds other than water or alcohols.

The second type of heat-setting or curing mechanism in finishing fabrics involves addition reactions, ie, two or more molecules of the finishing agent react with each other or add on to the fiber polymer but no by-products are formed. This is illustrated in Table II.

There are not as many examples of this class of textile finishing agents available although several new developments show commercial possibilities. These include: active methylene compounds, imine derivatives, and oxirane-containing products.

Because of present commercial importance, the discussion of catalysis is herein limited to the first class of condensation reaction products, where a simple acid-base catalysis mechanism usually is involved. In the second case of addition reactions, there may be both acid-base catalysis and more specific catalysis mechanisms, such as oxidation-reduction and surface adsorption.

TABLE I
CONDENSATION REACTIONS

$$-CH_2OR + HB \rightarrow \begin{cases} \text{Infusible resin} + ROH \\ \text{Reactions with fiber} + ROH \\ \text{Both reactions} + ROH \end{cases}$$

Where R = Low alkyl or hydrogen
B = Active hydrogen product

TABLE II
ADDITION REACTIONS

$$A + B \rightarrow C$$

Examples:

$$BH + CH_2 = CH - R \rightarrow BCH_2CH_2R$$

$$BH + \begin{matrix} CH_2 \\ | \\ N - R \\ | \\ CH_2 \end{matrix} \rightarrow BCH_2CH_2NHR$$

$$BH + CH_2 - \underset{\diagdown\, O \,\diagup}{CH} - R \rightarrow BOCH_2\underset{|}{C}HR \quad (OH)$$

* Presented at the General Technical Meeting held September 22, 1955 in the Viking Room of the Haddon Hall Hotel, Atlantic City, N J.

perature in application. This may increase the rate of reaction, but in some cases will also decrease the efficiency in that a low reaction yield is obtained, especially in exothermic reactions. In many textile operations, moreover, there are serious limitations, eg, as to what temperature may be used in heating a chemically impregnated cloth. Therefore, the alternative is to use a catalyst to bring about the necessary reactions in the allowable time and with the highest possible yield of infusible resin or reaction with the fibers.

By classical definitions, a catalyst is a substance which increases or decreases the speed of a reaction without undergoing permanent chemical change itself. A catalyst can alter the speed of a reaction, but it cannot initiate a reaction that will not take place of itself. Why some chemicals have catalytic effects on a reaction is in many cases not well understood. The general theory, however, is that in positive catalysis the catalyst lowers the activation energy of the system so that a larger number of molecules have sufficient energy to react and the reaction proceeds at a faster rate. An increase in activation energy lowers the reaction rate. While this negative catalysis is not generally thought of in textile finishing, it is important in considerations of product stability and explains the functions of many stabilizer additives used in chemical products to temporarily reduce their reactivity.

The finishing of textiles is constantly changing more and more from an art to an exact science. While in the early days of finishing with synthetic chemicals many of the finishing mixes contained relatively simple ingredients, the increasing trend is to use multiple finishing agents in the same bath. The reason for this is not necessarily because of better performance, but rather economic considerations. For example, if a fabric is desired which is wash fast, stabilized against shrinkage, crease resistant, durably water repellent, and has a particular hand or feel, there is no known natural or synthetic chemical which alone will produce all these effects. Although, in this case, separate processes could be used to apply the necessary finishing agents, the cost of padding, drying, curing, and washing after each application would be economically impractical. It has been demonstrated, however, that in select cases of silicone treatment of cellulosic fabrics, a greater durability to alkaline washing is obtained if the silicone is applied separately to a fabric after it is resin treated.

The use of more and more complex formulations in attempts to produce multiple functional effects on a fabric is constantly increasing the number of problems in finishing plants. These problems are of two general types:

1) Problems in Application
2) Problems on Cloth

The application problems may involve lack of bath stability, lack of compatibility, toxicity of ingredients, corrosion of equipment, lack of uniformity of finish, noxious fumes on curing, and speed of curing. The problems in regard to the cloth may involve shade changes, poor light fastness, objectionable odors, resin decomposition, fiber damage, migration, low pH, dermatitis, spotting, dusting and poor mechanical properties. These latter problems become extremely important with the presently increasing practice of not washing chemically finished fabrics.

Since, in complex formulations, we may have a variety of heat-setting resin or fiber-reactive compounds, one of the practical problems is efficient and optimum cure of all the reactive ingredients on the cloth. With the exception of silicone polymers, which require selective catalysts, most of the other useful agents used together are amenable to curing with acidic substances. A catalyst is generally used in small amounts in relation to the total solids of other ingredients, yet the type of catalyst may have a profound effect on the cloth and the other properties mentioned above if it contains active hydrogen groups, which can coreact with the functional groups of the finishing agents. (See Table III).

To demonstrate this, let us examine the various classes of useful acidic catalysts for curing chemical products on cloth and see what by-products may emanate from the catalyst and be evolved or left on the cloth during curing. Since, in most applications, formaldehyde is present from the various resins used, the interaction of catalyst with formaldehyde is most important.

In the first class of catalysts, Table IV, we have the originally (and still commonly) used ammonia salts for formaldehyde-nitrogen resins.

The residual products resulting from the use of such catalysts in curing may be:

1) The original salt left unreacted
2) Thermal dissociation into base and acid
3) Formation of hexamethylene tetramine
4) Formation of various methyl amines by a reductive alkylation of ammonia by formaldehyde in the presence of reducing agents
5) Aminomethylation of the resin.

In the second class of primary amine salts of mineral acids, Table V, we have an even larger number of potential by-products from the catalyst used. These may include:

1) The unchanged amine salt
2) The dissociated base and acid
3) Methylol amines
4) Methylene bis amine
5) Azomethines
6) Aminomethyl resin coreactant
7) Reductive alkylation of the amine
8) Cyclic trimethylene triamines

TABLE III
CATALYSTS AS COREACTANTS IN ACTIVE FINISHES

$$-CH_2OR + HK \rightarrow -CH_2K + ROH$$

Ammonium salts
Primary amine salts
Secondary amine salts
Alkanol amine salts
Hydroxy acids
Amino acids
Nitrogen metal complexes

TABLE IV

Catalyst types	*Residues and byproducts*
$NH_3 \cdot HX$ (Ammonium salts)	$NH_3 \cdot HX$
	$NH_3 + HX$
	$C_6H_{12}N_4(HX)$
	$CH_3NH_2(HX)$
	$(CH_3)_2NH(HX)$
	$(CH_3)_3N(HX)$
	$Resin-CH_2NHCH_2-Resin(HX)$

TABLE V

Catalyst types	*Residues and byproducts*
$RNH_2 \cdot HX$ (Primary Amine Salts)	$RNH_2(HX)$
	$RNH_2 + HX$
	$RNHCH_2OH(HX)$
	$RNHCH_2NHR(2HX)$
	$RN = CH_2(HX)$
	$RNHCH_2-Resin(HX)$
	$RNHCH_3(HX)$
	$RN(CH_3)_2(HX)$

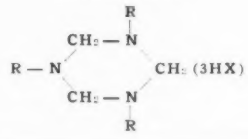
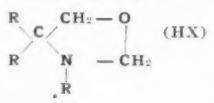
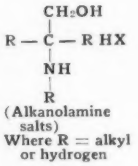


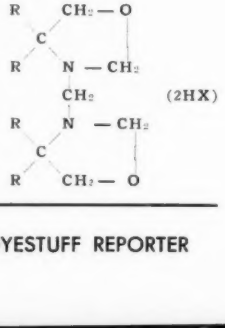
TABLE VI

Catalyst types	*Residues and byproducts*
	Same as in $RNH_2 \cdot HX$
	Same as in $RNHR \cdot HX$





(Alkanolamine salts)
Where R = alkyl or hydrogen



The third class of alkanol amine salts, Table VI, may produce all of the amine-formaldehyde products found with primary and secondary amines plus cyclic oxazolidine derivatives.

In the case of secondary amine salts, Table VII, the total number of possible reactions is reduced, but similar products to the primary amines may form.

In the case of tertiary amine salts, Table VIII, we have no reaction with formaldehyde or resins and there can be formed only:

1) The undissociated original salt
2) The dissociated base and acid

In this last class of amino-salt type catalysts, then, we have the least number of by-products formed in curing or left on the cloth.

In the case of organic and mineral acids or in acid salts, Table IX, we again have no interaction with formaldehyde to produce new products and will recover the original acid or one of its salts formed from other ingredients in the finishing mix.

In the last important class, that of metal salts of weak bases and strong acids, Table X, we have again a limited number of possible residues, but may obtain metal-resin complexes.

These various byproducts of cure, which may be obtained from catalysts used in finishing mixes containing formaldehyde resins, are not just postulated or theoretical. Many of the amine-formaldehyde derivatives shown have been made by such reactions. In some cases, these same undesirable reactions for textile finishing are commercially important reactions in synthesizing new alkyl amines or amine-modified thermosetting resins.

While the number of products which may form in finishing from these general classes of catalysts looks frightening, actually we do not know how many of such compounds are definitely left on the cloth or are evolved in curing, since some of the reactions shown will only take place under selected specialized conditions. It is important, however, to point out that, while many of the simple amines have ammonia like odors, many of the formaldehyde-amine derivatives have more objectionable characteristic odors, which they may impart to the cloth if no afterwashing is practiced.

Examining the various families of acidic substances which may serve as useful catalysts, it would appear that we have available an unlimited number of good catalysts. Actually, in most textile operations the number in each class is limited by various practical considerations, such as toxicity, color, yellowing tendency, low pH, poor bath stability, odor, too many of the mentioned byproducts of cure, incompatibility, and cost. However, the continued exploration of these classes is periodically uncovering members with minimum objectionable properties and greater usefulness.

While catalysts may contribute a number of residual materials on cloth, we must also examine the contribution of other minor ingredients in the basic products being applied, for in many cases either the catalyst or the basic finishing agent may be erroneously blamed for troubles or poor performance. We are accustomed to think of a finishing mix as containing a resin, a stiffening agent, a catalyst, etc, as though these are the only ingredients in the mix. Let us consider what other trace materials are present in the most prominent finishing agents other than the major components.

TABLE VII

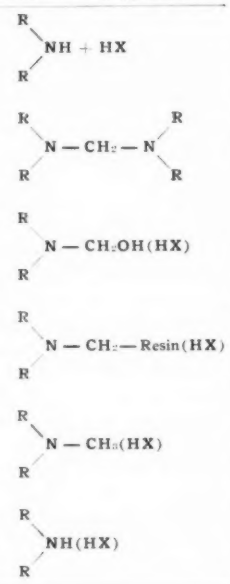
Catalyst types	*Residues and byproducts*
(Secondary amine salts)	

TABLE VIII

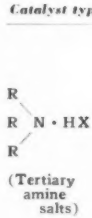
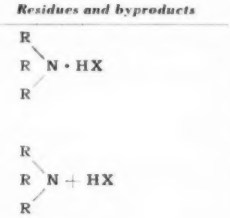
Catalyst types	*Residues and byproducts*
 (Tertiary amine salts)	 No formaldehyde adducts

TABLE IX

Catalyst types	*Residues and byproducts*
RCOOH (Fatty acids)	None RCOOH RCOOM
HX (Mineral acids)	None HX MH
NaHX (Acid salts)	NaHX H_2X Na_2X

TABLE X

Catalyst types	*Residues and byproducts*
$M \cdot X_n$ (Polyvalent metal salts)	$M \cdot X_n$ $M(OH)_n + nHX$ Coordinated complexes with resins

THERMOSETTING NITROGEN BASE-FORMALDEHYDE RESINS——In this class we have the major components, whose properties we want to use to improve or modify fabrics, ie, monomers or condensates. But in addition to these we also may have trace chemicals which are necessary in the manufacture or in the storage of the material, eg, NaOH, borax, amines, Na acetate, phosphates, alcohols, glycols, sugars, proteins, unreacted base, free formaldehyde. These, of course will vary with the manufacturer's preference or with chemical differences in the resin types.

CATIONIC SOFTENERS——In the case of cationic softeners, which are commonly used in resin mixes, we again have the base product plus a number of other trace chemicals depending on the type of product in question. *Major components:* fatty acid derivatives or quaternary ammonium salts. *Trace materials:* chlorides, phosphates, sulfates, acetic, formic, other acids, emulsifiers, amino bases, amide condensates, NaOH, KOH glycol, esters of fatty acids. Some of these secondary ingredients generally result from the processing and are not added simply to have them in the product.

DYE-FIXING AGENTS——In the case of dye-fixing agents, in addition to the base resinous ingredients there may be metal salts, complexes, byproducts of reaction or other additives used for improved performance. *Major components:* polyamine condensates. *Trace materials:* metal salts, complexes, organic acids, formaldehyde, ammonium salts, free amines, dicyandiamide, amides, copper salts, quaterary ammonium compounds.

SILICONE WATER-REPELLENT EMULSIONS AND EMULSIFIED OIL-SOLUBLE CATALYSTS——Here we have the major base products plus other additives needed to make stable emulsions. *Major components:* silicone polymers. *Trace materials:* emulsifier for silicones,

sequestering agents, resins, formaldehyde, protective colloids, salts, tin soaps, zinc soaps, zirconium soaps, catalyst emulsifiers.

NONDURABLE WATER REPELLENTS———Here the major ingredients are always the paraffin waxes plus metal salts. The other products are used for emulsification. *Major components:* paraffin waxes. *Trace materials:* aluminum salts, zirconium salts, gelatin, glue, proteins, organic acids, salts, amine and other soaps.

RESIN-BASE WATER REPELLENTS ———In this case there may be fatty acid derivatives, polyesters, resinous products, formaldehyde and a number of minor ingredients used to prepare a stable emulsion of the base material. *Major components:* resin products, polyesters, fatty acid amides. *Trace materials:* formaldehyde, alcohols, glycols, metal salts, amines, ammonia, emulsifiers, sulfonates, sulfates, protective colloids, stabilizers, viscosity depressors, added resins, coreactants.

From such a cursory examination we can see that, in a multiple finish treating bath, we not only have the major products needed for producing specific effects, but we also have a very large number of minor ingredients and chemicals. It is in such cases that we find problems of poor catalysis, odors, lack of compatibility, shade changes, etc. But with all the possible interactions of the various trace chemicals, it becomes very difficult to discover causes of troubles reported by finishing plants and find the culprit.

The following finishing formula has been used at times to produce a water-repellent, quick-drying, creaseproofed and stabilized viscose-acetate gabardine:

30% methylol urea resin (60%)
3% polymeric resin (80%)
6% silicone emulsion (30%)
2% silicone catalyst emulsion (25%)
1% amine hydrochloride catalyst (30%)
2% dye-fixing agent
Total bath solids = 25.0%
Total solids deposited = 17.5%
Fixed solids found = 14.0%
Solubles present = 3.5%

If we examine the material balance of curing such a complex mixture in the laboratory we find that, if the fabric has not been afterwashed, there is present on the cloth 3.5% water-soluble or easily removed mixture of original trace materials or byproducts of the cure. By recalling the various catalyst byproducts plus the inert ingredients in the remaining finishing agents we can expect that the 3.5% solubles represents the following products:

Low resin polymers—water-soluble
Formaldehyde
Amine salts
Copper salts
Surface-active agents from silicones
Zinc 2-ethyl hexoate
Unreacted resins
Silicone byproducts
Soluble salts from resin preparation
Formaldehyde polymers
Amine formaldehyde byproducts

To what extent all or some of these products can be left on the cloth safely is very difficult to predict. Also, if problems of dermatitis, fishy odors, caramel odors, formaldehyde odors, low pH, shade changes, etc, are encounted in storage of such unwashed treated fabrics, it is very difficult to blame a catalyst or any one single ingredient in the complex finishing formula.

How the choice of catalyst and resin may influence such properties is illustrated in the following experiments.

Cotton fabrics were treated with water alone, with catalyst alone and with combination of catalyst and various synthetic resins. The resin samples were all experimental materials and not commercially available, but represented useful classes of stabilizing and creaseproofing compounds. After the fabrics were cured, their tensile strength was measured. Part of each fabric was then heated in a scorch tester for 30 seconds at 375°F. The fabrics were left unwashed after cure so that the effect of residual products on the cloth could be determined.

Table XI shows the results when various resins and catalysts were used.

When used alone and cured on the cloth, oxalic acid caused a high reduction in strength, which was further aggravated by the scorch treatment. When used with different resins, there was a general buffering affect noted, and less tensile loss was produced by the combined resin-oxalic acid combination. The resistance to scorching losses in strength also varied with the resin type.

With ammonium chloride we see a greater reduction in strength on scorching when the catalyst-resin byproducts were left on the cloth. Again the magnitude varied with the resin type. The last-named resin (M-UF2) showed the least effect from not being afterwashed.

Also with magnesium chloride, the M-UF2 resin was least affected by residual products left on the cloth.

The fourth catalyst tested was an experimental alkanolamine salts. Here generally less strength changes were noted than with other catalysts and the buffering effect of the resin was not as apparent.

Since the loss in tensile strength found initially and on scorching might be related to the acid combining capacity of the initial and the cured resin, tests were made using an amine salt catalyst with formaldehyde, which has no nitrogen to contribute to acid neutralization, and with specially prepared nitrogen-formaldehyde resins made from urea, melamine, and an alkylaminomethyl urea of high base strength. These were tested at about equivalent performance levels. The results shown in Table XII indicate a considerable acid protective affect from the increased basicity of the resins.

The nonbuffering formaldehyde caused a high reduction in strength due to residual catalyst byproducts left on the

TABLE XI
TENSILE CHANGES IN UNWASHED FABRICS DUE TO SCORCHING

Resin	*Catalyst*	*Cured-Tensile (lbs)*	*Scorched-Tensile (lbs)*
None	None	63	61
None	$H_2C_2O_4$	27	5
M-UF0	$H_2C_2O_4$	38	35
M-UF1	$H_2C_2O_4$	36	27
M-UF2	$H_2C_2O_4$	44	38
None	NH_4Cl	51	8
M-UF0	NH_4Cl	40	24
M-UF1	NH_4Cl	37	18
M-UF2	NH_4Cl	41	41
None	$MgCl_2$	45	17
M-UF0	$MgCl_2$	48	30
M-UF1	$MgCl_2$	38	20
M-UF2	$MgCl_2$	40	39
None	$HORNNH_2HX$	61	52
M-UF0	$HORNNH_2HX$	44	42
M-UF1	$HORNNH_2HX$	37	33
M-UF2	$HORNNH_2HX$	41	39

TABLE XII
TENSILE LOSS ON UNWASHED FABRICS DUE TO SCORCHING

Resin Type	*Catalyst*	*Cured-Tensile (lbs)*	*Scorched-Tensile (lbs)*
None	None	94	83
None	RNH_2HX	81	52
Formaldehyde	RNH_2HX	75	38
Urea-HCHO	RNH_2HX	85	68
Mel-HCHO	RNH_2HX	91	70
Amino-UF	RNH_2HX	90	80
N_2Free Resin	RNH_2HX	85	87

cloth. However, this experiment was not conclusive, since a nonnitrogenous, nonformaldehyde resin with no acid-combining capacity also failed to show tensile losses on scorching in spite of residual catalyst products left on the cloth.

From the results of these tests on simple finishing formulas we can see that considerable variations exist in the effect of a catalyst on fabric properties. An excellent catalyst for one resin is not necessarily ideal for another. Moreover, in cases where multiple products are applied together in one mix, there can be no *a-priori* conclusions drawn that a particular catalyst will produce the best cure and the least side problems on all the active ingredients. Even in the best systems that have been worked out, one still finds unexpected results when a new variation in the finishing process is introduced. For example, one of the experimental resins (M-UF2), which had responded so well to all catalysts and protected the cloth on scorching, was tested further with the experimental amine salt that had shown the least effect on tensile properties with any of the resins. The expectations (from these tests) were that such a dual combination might be foolproof and not critical in regard to plant variations in curing temperatures or possible gross mistakes in weighing while the finishing mix was being prepared. In these tests, the normal 0.5% catalyst concentration was used as control. Then 60% and 100% excess catalyst were tested by curing the cloth at different temperatures. The results are shown in Table XIII.

Here we see that at 280°F there is no apparent difference in performance, even when 100% more catalyst than necessary is needed. By curing at higher temperatures, we now find that even this "foolproof" combination of special catalyst and resin becomes sensitive to overcuring and leads to acid fiber damage. The lower crease recovery values with increasing concentrations of amine salt also show a dilution effect on the efficiency of the resin, presumably by reaction of methylol resin groups with the primary amine.

There are many other problems related to catalysis of heatsetting products especially when they are used in multiple combinations. More and more it becomes necessary to alter the desirable conditions for applying a product because of the other ingredients which are to be mixed with it; then we may detract from its performance. This is illustrated in Table XIV in an extreme case of catalysis of a special emulsion silicone polymer for durable water repellency on nylon fabrics.

In many such applications, curing times are "borderline" in some finishing plants handling nylon fabrics. Therefore, a faster or different type of curing catalyst would be desirable. By testing a normal catalyst at short curing times, we find that optimum results cannot be obtained. Then with trace amounts of ferrous salts we greatly accelerate the cure of the silicone. By using a different catalyst system based on polyamine compounds, some of which we have found to be fast catalysts for silicones, again we can obtain improved performance. Not only is the efficiency of these catalysts important, but also the fact that the polyamines in question are water soluble is of practical value. Such catalysts, however, are completely worthless as soon as one wants to mix formaldehyde resins for other effects on nylon. In such blends, no curing is obtained because of preferential reaction of the polyamine with the formaldehyde resin.

Again, in a simple system, there is no problem of curing silicones on textiles with proper heat and catalysts. By increasing the number of other finishing agents in the same mix we begin to encounter anomalous effects in performance. For example, in a particular silicone urea-formaldehyde mix we attained improved durability by using an alkanolamine silicofluoride while a primary amine silicofluoride caused complete negative catalysis and no curing of resins or the silicones. In many combinations of silicone cured by oil-soluble salts of tin, zinc, lead, zirconium, and fatty acids, traces of metal sequestering agents can produce catalyst poisoning and poor curing, while on the other hand, it is possible to make metal sequestering agent complexes efficient silicone catalysts.

CONCLUSIONS

It is not possible to cover here all the other possible reasons for proper and improper catalysis in complex textile-finishing treatments or other problems which may arise in such treatments. Catalysis of simple finishing agents can be made foolproof by following the manufacturers' recommendations, but in combining two or more diverse types of products, great care is necessary in arriving at proper choice of catalysts.

Special warning should also be given to those who do not afterwash fabrics which contain a multitude of minor amounts of various chemicals, for these may later cause problems during storage or in the use of the finished fabric. Such problems may involve hydrolysis or degradation of the finish, dermatitis, odors, changes in dyestuff properties, or fiber damage in subsequent heat treatments.

QUESTIONS AND ANSWERS

Question: From the results on your tabulations and your schedules, can we look forward to getting any better physical properties in the resin-treated natural fibers, such as tensile strength and increased tear resistance?

Answer: I am afraid there is not very much to look forward to as far as spectacular improvement in the mechanical properties is concerned. The very mechanism which produces crosslinking and the desirable changes that you want in the cloth, such as stabilization and crease resistance, is responsible for the reduction in tensile, tear- and abrasion-resistance

TABLE XIII
10% RESIN (50% SOLIDS) CURED AT VARYING TEMPERATURES ON COTTON

Catalyst	*Temperature*	*Tensile (lbs)*	*Crease recovery (Degrees)*
0.5% RNH_2HCl	10 min, 280°F	50	120
0.8% RNH_2HCl	10 min, 280°F	49	118
1.0% RNH_2HCl	10 min, 280°F	51	116
0.5% RNH_2HCl	5 min, 330°F	49	121
0.8% RNH_2HCl	5 min, 330°F	48	119
1.0% RNH_2HCl	5 min, 330°F	42	110
0.5% RNH_2HCl	1 min, 400°F	49	123
0.8% RNH_2HCl	1 min, 400°F	39	122
1.0% RNH_2HCl	1 min, 400°F	32	118
Untreated control		62	85

TABLE XIV
SHORT CURE OF 2% METHYL HYDROGEN SILICONE ON NYLON SPECIAL EMULSION

Catalyst (% in bath)	*Additive (% in bath)*	*Spray Ratings Initial*	*Dryclean*	*Wash*
0.5% Zinc Octoate	None	80	70	70
0.5% Zinc Octoate	0.05% $FeSO_4$	100	80	80
0.5% Zinc Octoate	0.10% $FeSO_4$	100	100	90
None	0.50% $FeCl_2$	100	90	90
None	0.50% TEPA*	100	80	90
None	0.50% polyamine	100	100	100
None	0.50% amine soap	100	80	80

* Tetraethylene Pentamine

properties. There is a natural phenomena in that the two effects come at the same time from the crosslinking and reduced extensibility of the fibers. If you get one, you get the other. It has not been possible yet, in practice, to do anything else, although there are possible theoretical solutions. I do not think there will be any solution to the problem in the immediate future. To some extent it is a physical impossibility, because the mechanism of obtaining these positive changes that we want is the same that produces the undesirable changes in the mechanical properties. The degree of change, however, can be maintained at the absolute minimum by control of such factors as overcuring or the use of less acidic catalysts, which could affect the hydrolysis of the cellulose materials.

Q: I have one question referring to residue products, such as the coordinated metal complexes. Are these of value in inhibiting or protecting the fabric in some manner because of the complex formation?

A: I really do not know the complete answer to that. I do not personally believe that they are of value in that protective effect. They are of value in other respects. There are indications that, in specific triazine-formaldehyde types of resins, metal complexes formed help to change the properties of the material very drastically and improve the efficiency of the basic resins used. I do not know whether a protective effect is attained on the cellulose by the formation of such metal-resin complexes.

Q: Have you checked the effect of the scorch on a resin-treated fabric that had been washed?

A: Yes; it was not shown in the slides, but the changes there are of a low order of magnitude, amounting to less than 10 percent, while the changes noted on the slide in many cases went up to almost 100 percent on the unwashed resin-treated cloth.

Q: Have you studied the protective action of urea in resin finishing?

A: Urea has a very good action, as do many other amido compounds. However, the effect is limited. The effect is very specific in resin mixtures or complex mixtures where the free formaldehyde content of the padding mixture is very low, and the amount of the formaldehyde liberated on curing the resin is also very low. In those cases, small amounts of urea, or even products such as formamide and dicyandiamide, will show a great protecting effect. However, there are numerous resins on the market which contain high amounts of free formaldehyde—5-10%. They also contain a large amount of formaldehyde, which is loosely bound and which comes off during drying or curing of the cloth. It is not possible to put in enough urea to counteract it. If you do, you get a great diluting effect and a decrease in efficiency on crease-proofing and stabilization, since some of this effect is produced by the formaldehyde reaction with the fibers.

Q: With reference to the loss of tensile strength on the scorching, would you say that comparable losses occurred on room temperature aging of the textile fabrics?

A: I do not know, but I present it as a problem that needs investigating. What is the effect of these residues and complex products left on the cloth? We do not know. It has not been investigated.

Q: Would you assume that it might run more or less parallel?

A: The rate would be greatly different if you consider storage of cloth at room temperatures compared with scorching it at 365°F. There might be some very slow, continuous hydrolytic effect, which might be noticeable over a period of several years. The assumption is that the cloth would be washed or cleaned in use so that such byproducts would not be left permanently on the cloth except during the period of storage before sale.

Q: Following these resin treatments, is the end life or the usefulness affected? What is the effect as compared with that on untreated cloth?

A: Do you have resistance to abrasion or to wearing in mind?

Q: Yes.

A: That is hard to say. According to accelerated laboratory tests, because of the apparent large changes in mechanical properties noted by test gadgets, the life of resin-treated fabrics should be greatly reduced. That actually does not always happen in good resin-finishing practice. The only thing shown is that the mechanical tests made in the laboratory are sometimes misleading and do not always relate to practical wear, with reference to abrasion-testing procedures. I did not include tables of abrasion and tear, but these properties also would have changed because of resin treatment. The implication would be that the wearing life of such a garment or fabric would be related to the percent of change as compared with the wearing of the untreated cloth.

The tests which I, as well as other people, have done do not substantiate that effect in most cases. For the most part, resin-treated fabrics do have a better wear life, especially rayons that are washed often. All formaldehyde-resin applications increase the wet strength and wet abrasion resistance of rayon, which is normally very low. My feeling, in the case of the wearing properties, is that the laboratory tests do not reflect the actual performance in use.

Q: Have you found any indication that the use of metalic-chloride type catalysts have any effect upon the comparative chlorine-retention factor?

A: I have no first-hand information on it.

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Arnel——

(Concluded from Page P94)

is required with either of the roll or frame hot-gas processes.

One of the advantages of the frame-radiant heat unit is greater control of tension and stretching. This type of unit can continuously pad finish, preheat, dry, and heat treat in one operation.

A wide variety of *roller cure boxes* and *loop cure boxes* have been evaluated for heat-treating of Arnel fabrics. The roller boxes tend to stretch the fabric, but may be used where cotton or rayon are blended with Arnel. The loop cure boxes can be used on continuous filament or tightly woven spun fabrics which will not shrink excessively under the relaxed, tensionless conditions.

SUMMARY

During the first year of the commercial availability of Arnel a sufficiently large yardage of fabric has been processed in commission dyehouses to establish its essential processing properties. A wide range of shades of optimum balanced color performance have been produced under commercial conditions using selected disperse dyes, maximum dyeing temperature, proper application of inhibitor both for gas- and "O"-fading, and accelerant to improve the dyeing of heavy shades.

Satisfactory progress has been made in the reserve, cross and union dyeing of Arnel blends with cotton, rayon and wool. Of particular interest is the vat dyeing of cotton without saponification or staining of the Arnel component of the blend.

The heat-treatment processes originally developed for nylon and Dacron have been adapted for Arnel. In particular, the Morrison 2-can and the National Dryer 6-can systems have given satisfactory results.

ACKNOWLEDGMENTS

This paper is a summary of the work of many people in commission dyehouses in cooperation with Celanese technical personnel. Particular mention must be made of the extensive experience attained by the Fair Lawn Finishing Co in the jig dyeing of Arnel.

While it is not possible to acknowledge here all of those who contributed to our present knowledge of Arnel, particular mention is given to the management of the Celanese Corporation of America for its foresight, to Reiner G Stoll for his encouragement and leadership, and to A F Tesi for his editorial assistance. Mention also should be made of John R Adams, Jr, for his work on developed colors, to Jerome Rudy for research on accelerants and carriers, to George Rigley for the dyeing of blends, and to the personnel of the Hopewell, Virginia, dyehouse of the Celanese Corporation of America.

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Ned C Sprinkle—Head dyer, Wilkes Hosiery Mills Co, No Wilkesboro, N C. Section: Pied. Sponsors: J B Foster, Jr, R A Link.

Lang Sheng Sun—Mgr, International Dyeing & Weaving Works Ltd, Taipei, Formosa, China. Sponsors: K Wenzel, R C Brown.

Louis L Touton—Mgr, Calif Textile Mills, Armona, Calif. Section: PSW. Sponsors: F H Ahl, D O Paulsen.

Arthur R Tremaine—Asst mgr, Duplan Dyeing Co, Valleyfield, Que, Canada. Sponsors: L E Moody, W J Ratcliffe.

Edward J Unsworth—Boss of Color Shop, Queen Print Wks, Providence, R I. Section: RI. Sponsors: B F Raffanti, S A Campellone.

Lewis M Vickery—Chemist, Wilkes Hosiery Mills Co, No Wilkesboro, N C. Section: Pied. Sponsors: J B Foster, Jr, R A Link.

Peter K Villinger—Textile chemist, Cliffside Dyeing Corp, Paterson, N J. Section: NY. Sponsors: C Heidman, R W Jacoby.

Hwei-Leng Helen Wong—Mgr, Tung Sheng Dyestuffs & Trading Co Ltd., Taipei, Formosa, China. Sponsors: R C Brown, K Wentz.

Yi Nan Yang—Mgr, Shinkong Spinning Co, Shinkong Trading Co & Hsinlung Textile Mill, Taipei, Formosa, China. Sponsors: R C Brown, K Wentz.

JUNIOR

Grady L Brothers—Sales repr, Dooley Chemical Co, Chattanooga, Tenn. Section: SCl. Sponsors: W G Agnew, O L Masingill.

Frank Wolski—Colorist-lab tech, Nyanza Color & Chemical Co, New York, N Y. Section: NY. Sponsor: L W Hansen.

ASSOCIATE

Pritchard C Douglass—Res chemist, Bausch & Lomb Optical Co, Rochester, N Y. Section: NF.

CORPORATE

James Hunter Machine Co

Pad-Dye Corp

Southern Latex Corp

APPLICATION FOR TRANSFER TO SENIOR MEMBERSHIP

Wilfred E Belanger

A R Sabasranam

William F Taylor

STUDENT

John L Mercer—Bradford Durfee Tech Inst. Sponsor: J Watters.

Henry C Ouelette—Bradford Durfee Tech Inst. Sponsor: J Watters.

Beverly T Adams—Philadelphia Text Inst. Sponsor: W H Hughes.

D Suzanne Condrey—Purdue Univ. Sponsor: R Padgett.

Ann M Pfister—Purdue Univ. Sponsor: R Padgett.

Roberta E Steeg—Purdue Univ. Sponsor: R Padgett.

Membership Applications——

January 27, 1956

SENIOR

Cecil W Brooks—Foreman of dyehouse, Union Bleachery Div, Cone Mills Corp, Greenville, S C. Section: Pied. Sponsors: W C Wilcoxson, W B Huntley.

Donato C Chiarello—Supt of dyeshop & mechanical print, Danubio Soc Anon, Ramos Mejia, Argentina.

Alvin A Drake—Overseer of dyeing, Standard Coosa Thatcher Co, Rossville, Ga. Section: SCl. Sponsors: J C Whitt, E V Helms.

David Fogel—Dyer, Sterling Dye & Finishing Co, Philadelphia, Pa. Section: Phil. Sponsors: J A Clark, L K McChesney.

John W Fulbright—Tech & salesman, Ciba Co, Inc, Charlotte, N C. Section: Pied. Sponsors: E T Mobley, A R Thompson.

Jan S Glinski—Text finisher, Consolidated Bleaching Co, Putnam Div, Mechanicsville, Conn. Section: RI. Sponsors: S B Sladen, J R Janket.

Samuel J Guertin—Sales, Leatex Chemical Co, Philadelphia, Pa. Section: Phil. Sponsors: J A Clark, J M McChesney.

Samuel L Hayes, Jr—Tech service repr, E I duPont de Nemours & Co, Inc, Wilmington, Del. Section: Phil. Sponsors: S L Hayes, S I Parker.

Edward S Johnson—Tech Dept, American Aniline Products, Inc, Chattanooga, Tenn. Section: SCl. Sponsors: J F Bohannon, Jr, C D Starnes.

Glen E Jones—Dyer, Barwick Carpet Mills, Inc, Lafayette, Ga. Section: SCl. Sponsors: P J Smith, A R Williams.

Marvin Mann—Overseer of dyeing, Standard Coosa Thatcher Co, Rossville, Ga. Section: SCl. Sponsors: J C Whitt, E V Helms.

Leo J McNamara—Chemist, Mohawk Carpet Mills, Amsterdam, N Y. Section: HM. Sponsors: E A Chevrette, J P Stanley.

John J Moulson—Dyer, Atlantic Rayon Corp, Providence, R I. Section: RI. Sponsors: W Walter, W S Pride.

Harry Palfreeman—Tech adv in dyeing & finish, Courtaulds Ltd, Montreal, Que, Canada. Sponsors: W J Ratcliffe, C E Coke.

Mortimer S Schiff—Executive, chg of prod & costs, Thermco Prod Corp, Quakertown, Pa. Section: Phil. Sponsors: J W Barton, T Hart.

Gustav A Schwen—Dep dir, head of Text Dept, Badische Anilin & Soda Fabrik AG, Ludwigshafen a Rhein, Germany. Sponsors: C Z Draves, A E Hager.

M Michael Solomon—Prod develop chemist, General Electric Co, Silicone Prod Dept, Waterford, N Y. Section: HM. Sponsors: W A Nelson, H J Leavitt.

ACTIVITIES OF THE LOCAL SECTIONS

PHILADELPHIA

FRED FORTESS, manager of the Dyeing & Finishing Area, Applications and Product Development Dept, Celanese Corp of America, presented his latest paper on Arnel at the January 13th meeting of the Philadelphia Section at the Drake Hotel, Philadelphia, Pa. An extensive question-and-answer period followed the presentation of the paper, which was entitled, "Arnel — 1956."

"Corrosion in Action," a color motion picture prepared by the Corrosion Engineering Section, International Nickel Co, Inc, was shown prior to dinner.

Frederick V Traut, Globe Dye Works Co, retiring chairman, was presented with a set of matched luggage.

Thomas H Hart, Hart Products Corp, the new chairman for 1956, introduced other officials of the Section, and announced the appointment of the following committee chairmen:

Program———Edward C Diehl, Ankokas Dyeing & Processing Co; *Membership*———Joseph A Clark, Sr, Leatex Chemical Co; *Publicity*———Thomas R Scanlan, Jr, Hart Products Corp; *Dining*———Albert E Stutzke, Globe Dye Works Co; *Outing*———A E Raimo, John Campbell Co; *By-Laws*———Richard B Stehle, Brehm-Stehle Co; *Sectional Advisory Research*———Louis B Cook, Millville Mfg Co; *Intersectional Contest*———William S Sollenberger, American Viscose Corp; *Corporate Membership*———Richard A Shimp, Du Pont Co; *Educational*———Alfred F Felgendreger, Continental Mills, Inc; *Golf*———Jack Adams, Parr Engineering Co; *Printing*———Thomas A Williams, Jr, Williams Bros.

Raymond W Jacoby, president of AATCC, congratulated Fred V Traut on his election as vice-president of AATCC for the Central Atlantic Region.

* * * * * *

The next regular meeting of the Philadelphia Section will be held on Friday evening, March 2, 1956, at the Adelphia Hotel, 13th & Chestnut Streets, Philadelphia, Pa. The Section will honor Prof Percival Theel, Philadelphia Textile Institute, who was recently elected chairman emeritus of the Section in recognition of the years of work and devotion he has contributed to AATCC.

Guest speaker at the meeting will be Hector C Borghetty, manager of textile chemical development, Rohm & Haas Co, Philadelphia, Pa. His topic will be "Wash-and-Wear Cotton Fabrics."

The speaker will discuss the technical, merchandizing and utilitarian aspects of cotton "wash-wear" fabrics. This term was coined by the manufacturers of hydrophobic synthetic fibers to indicate that garments made from their newer synthetics could be washed and worn without any ironing. The wide consumer acceptance of

PHILADELPHIA SECTION MEETING OF JANUARY 13TH—(L to r): Thomas H Hart, Hart Products Corp, 1956 chairman; Fred Fortess, Celanese Corp of America, guest speaker; Raymond W Jacoby, Ciba Co, Inc, AATCC president; Frederick V Traut, Globe Dye Works Co, AATCC vice president (Central Atlantic Region) and outgoing chairman.

PHILADELPHIA SECTION OFFICIALS FOR 1956 — Seated (l to r): Ernst W Empting, General Dyestuff Co, secretary; Donald W Robinson, Para-Chem, Inc, treasurer; Thomas H Hart, Hart Products Corp, chairman; Ernest Burrell, Roxborough Co, vice chairman; Richard C Kopp, Aberfoyle Mfg Co, sectional committeeman. Standing (l to r): Edward C Diehl, Ankokas Dyeing & Processing Co, program chairman; Harry L Morgan, James Lees & Co, councilor; Richard A Shimp, Du Pont Co, councilor; Matthew A Noonan, Becco Chemical Div, sectional committeeman; Clarence A Seibert, Scholler Bros, Inc, councilor; Arthur W Etchells, Hellwig Dyeing Corp, councilor; Francis E Nevins, Ciba Co, Inc, sectional committeeman; Jackson A Woodruff, American Viscose Corp, councilor. Absent when photo was taken: Virgil T Hartquist, Jefferies Processors, sectional committeeman.

these garments reflects the desire of the housewife to eliminate or minimize the drudgery of ironing.

The realization that cotton could be modified chemically and physically to yield fabrics that required "little or no ironing" soon brought about the large-scale adoption of thermosetting resins by the finishers of cotton fabrics; this was aided by a promotional campaign that sometimes overrated the garments or allowed the merchandizing of certain styles that did not meet the standards of quality that were first established.

Chemical finishing techniques employed to intrinsically modify cotton to impart wet and dry crease recovery, stabilization and minimum ironing care, require accurate control. The important interrelationship of resin content and physical properties of tear, tensile and abrasion necessitate correct interpretation of test methods, while the factor of chlorine resistance is of prime importance for cotton garments.

The speaker will also cover the influence of yarn and fabric construction and the effect of end-use of the garment. Mention will be made of the newer resin developed with particular emphasis on the incorporation of thermoplastic resins with thermosets.

* * * * * *

Specific topics for the new series of lectures on "The Application of Vat Dyes," which will be given at Philadelphia Textile Institute Mar 5-Apr 9 under the auspices of the Section's Educational Committee, have been announced as follows:

Mar 5———"General Principles of Vat Dyeing. Vat Dyeing of Viscose, Acetate and Nylon," Paul L Meunier, Du Pont Co; Mar 12———"Vat Dyeing of Cotton Raw Stock and Piece Goods," Sumner H Williams, General Aniline & Film Corp; Mar 19———"Vat Dyeing of Skeins, Warps and Packages," R Stewart Wilkinson, Philadelphia Textile Institute; Mar 26———"Printing with Vat Dyes," Raymond W Jacoby, Ciba Co, Inc; Apr 9———"Leucoesters of Vat Dyes. Vat Dyeing of Wool," Hans Luttringhaus, Progressive Color & Chemical Co.

For further details of the lecture series, see page P28, January 16th issue of *ADR*.

RHODE ISLAND

THE Rhode Island Section met on January 26, 1956 with 50 members participating in a "pre-meeting" social hour and dinner at the Crown Hotel, Providence, R I, and 75 in attendance at the technical session at the quarters of the Providence Engineering Society.

Guest speaker of the evening was Mark Weisberg, president of the Eltex Chemical Corp, treasurer of Wymat Chemical Corp, and treasurer of Technic, Inc, who spoke on "Textile Chemical Specialties — The Magic Skin."

Edward H Gamble, Councilor, reported on the 200th meeting of the AATCC Council, which was held in January.

AATCC president Raymond W Jacoby, had several remarks to make on the progress of the Perkin Centennial celebration, which will be held in New York this September.

SOUTH CENTRAL

THE officers of the South Central Section met on January 9th for the purpose of appointing committee chairmen and drafting a calendar of events for 1956.

Sectional meetings will be held Feb 24, Apr 28 and Dec 1 at the Hotel Patten, Chattanooga, Tenn. The Summer Outing will be held June 22-23 at Lookout Mountain Hotel.

The following committee chairmen were appointed: *Outing*———Lloyd R Greenwood, Southern Dyestuff Corp; *Membership*—Arthur Williams, Du Pont Co; *Corporate Membership*———James A Burkart, Burkart Schier Chemical Co; *Publicity*———William H Bass, Jr, Standard-Coosa-Thatcher Co; *Research Advisory*———Donald H Gunther, Burkart Schier Chemical Co; *Intersectional Contest*———Charles B Ordway, Burlington Engineering Co.

The speaker for the February 24th meeting of the Section will be James F Whalen, Jr, Becco Chemical Div, Food Machinery & Chemical Corp, Charlotte, N C. His talk will cover some of the more recent developments in bleaching.

In holding this meeting on a Friday, the South Central Section is departing from its usual practice of scheduling meetings for Saturday. If the "experiment" proves a success, consideration will be given to holding most the future meetings on Friday.

NOTICE TO AUTHORS OF PAPERS

MANUSCRIPTS for the *Proceedings* and for other publications of the American Association of Textile Chemists and Colorists shall conform to the requirements and standards given in this *Notice*. Before publication, manuscripts for the *Proceedings* shall be approved by the Editor, not only for editorial correctness according to the standards of this *Notice*, but also for content of technical matter. In his work, the Editor may enlist the aid of anonymous reviewers who are selected for expert knowledge in particular fields.

It is presumed that authors in studying the comments of reviewers and of the Editor will remember that all recommendations are made in a kindly, helpful, sympathetic manner to improve the paper in both literary and technical excellence. Although authors should cheerfully consider suggestions, they are expected to defend their position if justified, especially when strictly technical matters are involved with which the authors have an intimate knowledge.

MANUSCRIPTS—Manuscripts shall be typewritten double-spaced with approximately one-inch margins on 8.5 x 11-inch white paper. In addition to the *original*, at least one carbon copy is required. Pages are to be numbered consecutively with Arabic numerals, and each page after the first shall carry the authorship at the very top. Tables and figures shall also be numbered consecutively, the tables with headings containing Roman numerals as TABLE I, TABLE II, etc, and the figures with Arabic numerals as Figure 1, Figure 2, etc, appearing *below* the figures. The names of the authors and their laboratories or business connections should appear below the title of the paper.

ARTICLES APPEARING IN THE "PROCEEDINGS" IN RECENT ISSUES OF THE "AMERICAN DYESTUFF REPORTER" will be helpful to authors as models of form for the typing of manuscripts.

LITERARY STYLE AND FORM OF PRESENTATION—In the writing of papers, authors are requested to observe a trenchant, simple style of writing directed to textile chemists and colorists with at least an elementary knowledge of chemistry, physics, mathematics, engineering, textile processes and textile machinery.

In the organization of the material, there should be one or more introductory paragraphs setting forth the occasion, significance and main objectives of the paper and of the method of attack. This should be followed by the body of the presentation, either with discussions interspersed throughout this portion or with a collected section marked "DISCUSSION" after the main body of the paper. Finally, there may be a brief section at the end entitled "SUMMARY" of "CONCLUSIONS."

Center and side headings make for easier reading. Center headings should be employed sparingly and generally will include only very important section headings, such as "INTRODUCTION," "EXPERIMENTAL," "DISCUSSION," "CONCLUSIONS," "SUMMARY," and "REFERENCES." Side headings (see third paragraph of this *Notice* for an example) shall be indented and run into the text to which they apply, and shall be separated from the paragrpah by a dash. The publisher will print center headings in bold-face capitals and side headings in capitals.

LITERATURE REFERENCES AND FOOTNOTES—References to the literature and all footnotes (except those in tables) shall be numbered consecutively with underlined Arabic numerals in parentheses at the proper place in the text. Where a reference or footnote is to be used again, the original number is simply repeated; this obviates the necessity of repeating the footnote or reference at the bottom of the page. References to the literature shall conform to the universal usages followed by *Chemical Abstracts*, which include underlining of book and journal names to indicate italicization in printing.

The spelling and rules of punctuation followed in manuscripts shall be those found in the "Merriam-Webster New International Dictionary"; abbreviations and chemical formulas shall conform to *Chemical Abstracts*. Periods shall be used only at the end of sentences, not after abbreviations.

FIGURES AND GRAPHS—Figures and graphs should be black line drawings on white drawing paper. Photographic prints are acceptable, preferably glossy prints on double-weight paper. Duplicates should be available for dispatch to reviewers. Diagrams and graphs should preferably be designed in long form to cover one column of print but may be two columns wide or the width of a full page where necessary. In graphs the frame and actual curves should be inked more heavily than the co-ordinate lines, and these latter should not be too close together. Various styles of broken lines are sometimes desirable to distinguish curves. Experimental points should be given with small plane figures, such as circles, squares, diamonds or triangles. Numbers and legends on co-ordinate axes are to be lettered in the graph by the author. Numbers and titles of figures should be placed below the diagram or on the edge of the back. Each piece of illustration copy should bear on the margin or on the edge of the back the name of the author and the title of the paper.

Photographs of authors should be included with copy, to be run in conjunction with the paper. These must be on glossy stock, and should be large enough for proper reproduction.

TABLES—Tables should not be used indiscriminately because they are very expensive to set up in type. They should be designed to be one column, two columns or three columns wide. Tables should be arranged with the view of conserving space; column headings should be short and abbreviated. Quantity designations shall never appear in the body of the table but in the headings. Tables, if possible, should be placed in the manuscript where they belong rather than separately.

SYNOPSIS—A separately written synopsis of not over 200 words containing the gist of the subject matter must accompany every manuscript.

GALLEY PROOFS—Galley proofs will be sent to the author by the publisher for correction before publication. This should not be interpreted as an invitation to rewrite the paper but rather as an opportunity to correct errors.

REPRINTS—Fifty reprints of papers published in the *Proceedings* will be furnished without charge by the publisher if requested when galley proofs are returned. These reprints are printed on one side of the sheet only and then stapled together. A schedule of prices of reprints in the usual form accompanies the galley proofs.

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TRADE-MARKS — As the AATCC wishes to co-operate in the protection of trade-marks, it is requested that, in the body of the article, trade-marks be written with an initial capital letter. Courtesy demands that authors include competitive products as well as those of his firm. Many current trade-marks are to be found in the "AATCC Technical Manual and Year Book".

• PATENT DIGEST •

PAUL WENGRAF

PIGMENT—VAT DYEING ORLON———Developed in Concentrated Sodium Carbonate C,4,02

USPat 2,683,644 (Deering Milliken Research Trust——Livak)

This specification refers to the well-known difficulties encountered in dyeing Orlon acrylic fibers. Methods suggested in the past are described as impractical, expensive and in some cases, harmful to the fibers. The inventor discusses particularly a study by Thomas and Meunier {*Am Dyestuff Reptr 39*, P925-32 (Dec 12, 1949)} referring to vat dyeing of these fibers; it is stated there that anthraquinoid vat dyes show no affinity for continuous filaments, while most indigoid and thioindigoid dyestuff brands can be used at 212°F, particularly by adding high concentrations of potassium salts, eg, potassium carbonate, to the dyebath. In contrast to these findings, the inventor claims that no penetration occurs under these conditions, and at this temperature that the fastness to crocking is poor except in light shades, and that dyeings in heavy shades carried out this way tend to become uneven.

According to the patented method, dyeing with vat dyes on Orlon in medium to heavy shades can be effected by a pigment-dyeing method under specific conditions: the material must be introduced into a hot bath (from 175°F to the boil) containing the nonreduced, well-dispersed vat dye and thereupon into a boiling reducing bath composed of about 1% of NaOH, 1% of hydrosulfite and a great amount of sodium carbonate (about 30%), until reduction is complete. The dyeing is reoxidized at the boil with hydrogen peroxide and acetic acid. Reference to the "salting-out" action of sodium carbonate is surprising, as the inventor claims that potassium salts, as advocated by Thomas and Meunier, had no effect under these conditions.

Addition of sodium carbonate to the dyebath, however, produces an adverse effect. Introduction of the salt to the reduced dyebath results in weak shades only.

The padding and reducing steps require a longer time than usual. Padding in the boiling dyestuff pigment dispersion has to be repeated for a pickup of 100%. Otherwise the goods might be immersed in the boiling solution for 5 min to one hour. The immersion in the boiling reduction bath may also require up to one hour, the reoxidation in the boiling peroxide solution, from 5 to 10 minutes.

Example: A pad liquor contained 15 p Ponsol Jade Green Supra Double Paste (*CI* 1101) in 85 p water. Polyacrylonitrile cloth was padded at least 5 times in the boiling bath, then introduced in a boiling solution of 1% of NaOH, 1% sodium hydrosulfite and 30% of sodium carbonate. After the reduction was complete (about 15 min), the material was passed for 5-10 min through a boiling solution of 1% of hydrogen peroxide and 1% acetic acid, soaped at the boil and rinsed. Two soapings were sufficient to remove excess surface dye. A heavy green shade resulted.

A series of Calcosol, Algol, Sulfanthrene and other vat-color brands that will give satisfactory dark shades are enumerated in the specification.

References cited by the Patent Office:

Am Dyestuff Reptr 44, P925-32, esp P929, Dec 12, 1949 (Thomas & Meunier): see above.

Am Dyestuff Reptr of Jan 10, 1949 (Philadelphia Section, AATCC) discusses dyeing at temperatures of 212°F and more, mentioning on P 9-10 methods for dyeing animal and vegetable fibers at elevated temperatures.

Brit Pat 578,212 (Brit Celanese/1946): padding acetate of cellulose with a vat-dye dispersion at 65-85°C (preferably at 70-75°C), drying and developing with 0.2% of sodium hydrosulfite and 1.5-2.5% of sodium carbonate as the sole alkali (cf *Am Dyestuff Reptr 36*, 99-100, 1947).

MULTICOLOR PRINTING ———Contaminations Detected by Radioactive Substances D,1

Brit Pat 714,757 (Meitner)

In producing designs of more than one color by means of a roller printer, it is inevitable that small amounts of the paste from the first-hand printing will be carried over to the next roller, there contaminating the paste in the dyebox. This disadvantage is especially felt where the first color is dark and the subsequent printing colors are of lighter shade. In printing vat colors in reduced state, it is almost impossible to determine the color change during the printing operation by visual inspection. Taking samples from time to time and processing them necessitates stopping the machine, which is time consuming and uneconomical.

The inventor has devised a method for testing the degree of any contamination of this kind. It calls for the addition of a very small amount of a radioactive isotope to the paste in the first dyebox or to the color most likely to contaminate the following printing paste. Geiger-Mueller tubes are connected to the dyeboxes and the heads of the indicating instruments, which preferably are clamped on two sides of every dyebox, are dipped into the paste to determine its condition at different places. As soon as a small portion of the color containing the isotopes is carried over and mixes with the next printing paste, the Geiger counter will indicate the presence of the radioactive substance, and thus a certain degree of contamination; whereupon the contaminated paste has to be removed and fresh paste filled in.

The tolerable maximum contamination can be tested experimentally. If a series of standard contaminations is set up, it is easy to determine, by a reading on the instruments, whether the pastes in the second or the following dyeboxes are still pure practically or not. The first color paste is given a standard radioactivity by the introduction of a very small amount of the active substance, preferably sodium phosphate, containing radioactive phosphorus (P^{32}), which is commercially available at present. P^{32} emits beta rays, thus involving no health hazard because of the small amounts required.

Reference may be made to a full description of the method and apparatus in *J Soc Dyers Colourists 69*, 283 (1953) [cf abstract in *Am Dyestuff Reptr 42*, 765 (1953)] and in *Teintex* of Jan 15, 1952, p31-4.

SHRINKPROOFING WOOL ———Precondensates Cured in High-Frequency Electric Fields A,2,04

USPat 2,689,806 (Pacific Mills——Dalton, Kaupin)

The current patent is a continuation-in-part of a prior application by the same inventors of February 18, 1948, now USPat 2,545,450 [cf *Am Dyestuff Reptr 40*, 537 (1951)]. The difference between these two patents is that the older patent protects principally a treatment of woolen fabrics impregnated with (methylol melamine) precondensates with *infrared rays* as a source of heat, followed by curing at 212-300°F, while the current patent refers to a *single-step heating* of the wet material in a *high-frequency electric field*. It is significant that, under these new conditions, no special curing step is required. Complete curing in this step is possible without the liquid content of the fibers being reduced below about 20%. Continued application of the high-frequency field

will result in the liquid only being driven off without further resin condensation. In contrast, the infrared treatment described in USPat 2,545,450 reportedly caused mere transformation of the impregnating liquid into a viscous condition, calling for subsequent curing at higher temperatures.

An essential effect of this modified treatment is said to be the chemical combination of the thus-formed resins with the woolen material (fabrics, top, yarns, etc). The frequency of the field is limited to 5-50 megacycles, the time of treatment is between about 0.5-3 minutes.

Example: A wool fabric dyed with an acid dye was rinsed incompletely, leaving in the fabric about 4% of sulfuric acid to act as a catalyst. The fabric, impregnated with a bath containing 14% of methylated methylolmelamine, 5% of urea, 5% of trioxymethylene and a nonionic wetting agent, was squeezed to a pick-up of 60%. Curing was effected in a high-frequency field of 10 megacycles for 4 minutes at a temperature of 190-212°F. The process proved to be so rapid that practically no migration to the surface took place. The hand, compared with that of the original sample, was practically unaltered. The shrinkage of the warp was found to be 0.3% after eight launderings in contrast to a figure of 17.5% for the nontreated material under equal conditions.

An additional effect appears in the greatly improved fastness of the dyeings in subsequent laundering operations.

The main feature of the present invention, however, is the application of the high-frequency electric field, which permits single-step curing at lower temperatures, thus preventing damage of the fibers caused by temperatures over 212°F. (One of the examples refers to a treatment in a radio-frequency generator; this specific treatment is not covered by the claims. It has also been mentioned in the specification of USPat 2,545,450.)

References cited by the Patent Office:

USPat 2,545,450 (Pacific Mills): see above.

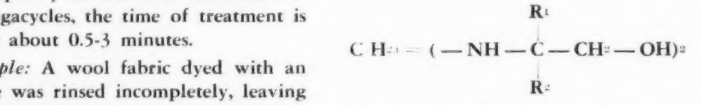
USPat 2,405,037 (Gen Electric/1946): protecting a special construction of a high-frequency heating device.

PRINTING WITH METAL COMPLEX DIRECT DYES ——Solubilized by Substituted Alkylene Diamines D,2,03

USPat 2,685,495 (Ciba Ltd——Wegmann, Menzi)

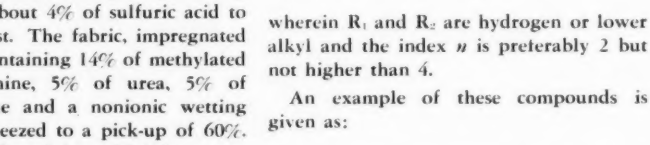
This patent refers to printing with direct (mostly tetrazo) dyes, which are capable of forming sparingly soluble metal complexes. Metals suitable for introduction into the dyestuffs are Ni, Co and preferably copper. Metallized azo dyes of this type are considered to be difficultly soluble when they dissolve at less than 0.5 g/l in a 1% of sodium carbonate solution.

These metal complex dyes give prints of superior depth of shade and very good fastness even after a short steam development (10 minutes). It has been discovered that the almost insoluble dye complexes can be dispersed well in standard printing pastes by the addition of certain organic nitrogen bases of the general formula



wherein R_1 and R_2 are hydrogen or lower alkyl and the index n is preferably 2 but not higher than 4.

An example of these compounds is given as:



MP 93-94°C

ie, 1,2-di(betahydroxyethylamino)-ethane, which is mentioned throughout all the 12 examples of the specification as a solubilizing agent, optionally also combined with urea, as a well-known solubility promoting compound. The bases can be prepared, according to Ger Pat 635,904 (I G Farben/1936), from alkylene dihalides and primary or secondary alkanolamines.

The metal complex dye may be produced in substance, but an obviously easier way is to form the complex *in situ*. In the latter event the metal-free dyes are mixed with urea and pasted with hot water, whereupon the solubilizing base is added together with sodium copper tartrate as the metal-providing agent. The dye dissolves upon boiling and the solution is stirred into a mucilage thickener, such as tragacanth. British gum thickeners, which have reducing properties, must be avoided because of the sensitivity to reduction of some of these dyes.

The examples refer to a great number of tetrazotized direct dyestuffs that may be incorporated into printing pastes as described above. The printed cotton or rayon goods are aged for 10 minutes, rinsed, and soaped. A formaldehyde-amino condensate may be added as a fixing agent. Deep prints of excellent fastness to washing and light reportedly are obtained.

References cited by the Patent Office:

USPat 2,256,806 (National Aniline/1941): a vat dye composition containing a hydroxylated aliphatic polyamine, eg, 1,2-di(ethanolamino)-ethane.

USPat 2,092,429 (Ciba Ltd/1937): dyeing vegetable fibers with finely subdivided complex metal compounds of direct azo dyes, which are practically insoluble in water and dilute alkalis, using an alkanolamine or a similar compound as a dispersing agent.

USPat 2,036,150 (Imperial Chem Ind/1936): producing a copper-containing tetrazo dyestuff by treating the metal-free dye with a hot, alkaline copper solution until alkyl groups have been split off and two Cu atoms enter the dye molecule.

USPat 1,904,013 (Carbide & Carbon/1933): preparing ethanolamines from ammonia and ethylene oxide under such conditions that the concentration on ethylene oxide remains relatively low throughout the whole reaction; the mixture of 25% diethanolamine and 75% triethanolamine thus obtained is claimed to promote penetration of dyestuffs.

Brit Pat 468,362 (Ciba/1937): dyeing vegetable fibers with metal-complex-forming azo dyes, adding to the dyebath metal salts in a caustic alkaline medium prepared, for instance, by heating a mixture of copper sulfate, potassium tartrate and caustic soda to elevated temperatures.

DYEING NYLON WITH AZO DYE COMPONENTS——— Developing with Mineral Acids C,4,07

Brit Pat 712,144 (Imperial Chemical Industries)

The introduction to this patent stresses the difficulties encountered in dyeing nylon with azo dyes according to conventional methods. Brit Pat 539,195 suggests that a dispersion of an arylamide of 2,3-hydroxynaphthoic acid in the form of its free hydroxy compound, be applied as a first bath, then that the material be introduced into an aqueous bath containing a diazoamino or diazoimino compound, and finally that the dye be developed with hot aqueous hydrochloric acid.

A simpler procedure, which reportedly gives equally good results, is protected by the current patent. It has been discovered that the aforementioned arylamides, either in the form of free hydroxy compounds in neutral or slightly acid dispersion or in the form of their sodium salt in strongly alkaline medium, can be combined in the same bath when certain stabilized diazo components are used, especially the *triazenes*, ie, compounds that contain a chain of three adjacent N-atoms. They are obtained by reacting a diazotized arylamine, such as 5-chloro-o-toluidine (Fast Red TR Base) with a primary or secondary amine, eg, diethanolamine. The azo dye is developed on the fiber by an aftertreatment with hot mineral acid, preferably hydrochloric acid. It is advisable to add common salts to the coupling component as an absorption promoter when the latter is applied in alkaline solution.

A similar process for dyeing acetate of

cellulose is described in Brit Pat 464,511 (same Company), but here the final development had to be carried out in organic acid solutions, in contrast to the present method.

Example: A paste containing 6 p 5-methoxytoluidide of 2,3-hydroxynaphthoic acid (thus an isomer of Brenthol MA), 10 p Turkey Red Oil (50%) and 120 p water was heated to the boil, while 16 p NaOH 28% was added. The clear solution was poured into a dilute solution of 80 p common salt in 920 p water. 500 p of a 2% dispersion of the triazene, as described in Brit Pat 464,511 (see above), was added. The solution was made up to 4000 p and heated to 80°C. Nylon yarn was worked in this mixture for 30 minutes, then rinsed in cold water, aftertreated at 70°C in 60 p hydrochloric acid (30%), diluted with 3940 p water and soaped for 15 min at 70-90°C. It appeared in a bright red color, fast to washing.

PRINTING DACRON——— Alkali-free Leucovat Pastes Applied D,2,07

Brit Pat 712,418 (Imperial Chemical Industries ——Liquorice, Michie)

Dacron fibers, ie, terephthalate glycol polyesters, have notoriously poor affinity for dyestuffs in general. It has been discovered that this material can be printed readily with vat dyes steamed in the presence of a reducing agent in an acid or neutral medium. Thus *any nonalkaline reduction* is within the scope of the current patent.

An alkali-free paste containing a vat dye of the anthraquinoid, indigoid or thioindigoid series, a thickener, a reducing agent and, optionally, a swelling agent is printed on polyethylene terephthalate fabrics, steamed preferably under superatmospheric pressure, and then reoxidized with ammoniacal hydrogen peroxide, and with nitrous acid. Nitrous acid is said to give superior results and should be applied whenever the dyestuffs are not adversely affected by this agent.

Still better results can be expected using a paste thickened with sodium alginate (but in absence of a reducing agent), drying and subsequently padding in the reducing solution, eg, zinc formaldehyde sulfoxylate, steaming and reoxidizing.

Example: 10 p Durindone Printing Red BS Paste (*CI* 1207), 65 p sodium alginate thickener, 4 p sodium salt of dinaphthylmethane disulfonic acid (Tamol), 17 p water and 4 p Turkey Red Oil were made in a paste and printed on a Dacron fabric. After drying, the material was padded in a solution of 25 p zinc formaldehyde sulfoxylate, 5 p Glauber's salt and 75 p water, steamed at a pressure of 40 psi, rinsed and reoxidized at 50°C in a bath containing an aqueous solution of 1.5% of hydrochloric acid and 1.5 p sodium *nitrate*, soaped, rinsed and dried.

PRINTING MORDANT COLORS THICKENED WITH CARBOXYMETHYL-CELLULOSE———Sequestering Agents Added D,2,05

Brit Pat 712,428 (Imperial Chemical Industries)

This specification refers to the printing of mordant dyes. The paste contains, in addition to the thickener, the dyestuff and the metallic mordants, mostly Al, Fe or Cr salts.

It has been observed that thickeners prepared from carboxymethylcellulose, carboxymethyl starch and sodium alginate, which have been widely used in recent times in the printing technique, give poor results in mordant printing in contrast to customary starch thickeners. The above-mentioned thickening agents were found to give insoluble precipitates with many metal mordants, either on the fabric or in the printing paste.

This drawback reportedly can be avoided by adding to the paste a sequestering agent, whereby premature precipitation is prevented. Sequestering agents to be used in this process comprise the substances providing an amino-polyacetate ion, such as Versene (ethylene diamine tetraacetic acid salt) and Trilon (nitrilo-triacetic acid), as well as water-soluble salts of (pentavalent) *phosphorus oxyacids*, eg, sodium hexametaphosphate or tetrasodium pyrophosphate. The 14 examples disclosed in the specification refer to the application of phosphates.

It is suggested that all the water-soluble ingredients be dissolved separately and that these solutions be stirred into the thickener that has been previously blended with the sequestering agent. Finally the insoluble mordant dye is added in paste form. The amount of sequestering agents may vary from 20 to 100% by weight of the mordant metal salt.

An example refers to block printing with Alizarine Red S paste on a calico fabric. 50% of a carboxymethylcellulose thickener (10% solids) was mixed with 10.5% of a 20% sodium hexametaphosphate solution; 15.1% solutions of Al, Ca and Sn salts, 3.3% of 10% tartaric acid and finally 21.1% of the dyestuff paste were stirred in. A dark red print was obtained after steaming, soaping and treating with a weak hypochlorite solution. With the omission of the hexametaphosphate solution, lump formation by precipitation of the carboxymethylcellulose in contact with the metallic mordant occurred immediately.

Reference may be made to analogous difficulties experienced in adding metal mordants, especially Cr salts, to gum thickeners. It has been suggested in the past that oxyaliphatic acids, such as lactic acid (Brit Pat 435,701 of Durand & Huguenin), derivatives of aliphatic amino acids (Brit Pat 453,834 of I G Farben), also the sodium salt of triglycolamido acid, ie, nitrilo triacetic acid (Swiss Pat 190,986 I G Farben) be added.

CELLULOSE ACETATE MODIFIED FOR ACID DYEING———Aftertreatment with Salicylic Acid F,2,03

USPat 2,690,954 (Du Pont——Weir)

Brit Pat 480,297 (*Soc Rhodiaceta*/Feb 21, 1938), which is quoted in the current specification, describes a process for modifying acetate of cellulose by incorporating into the esters nonproteinous polymeric compounds containing amino-nitrogen. Substances of the latter type are, according to the examples, various polymers of alkylamino ethyl acrylates or methacrylates and related compounds. The filaments thus modified acquire affinity for direct dyestuffs and particularly for acid dyestuffs.

Acid-dye-receptive cellulose acetate fibers modified by the above process are referred to as "basic cellulose acetate" fibers. It has been observed that the light fastness of acid dyeings on basic cellulose acetate products can be considerably improved by an aftertreatment with a salicylic acid solution. The preferred solvent for the acid is water warmed to 160-212°F to provide for proper solubility. The limits of concentration are between 2.5-25 g/l.

Example: A tubing knitted from cellulose acetate containing 5% of dimethyl amino ethyl methacrylate was dyed at 212°F with a sulfonated 2-anilino quinizarine acid dye. After 30 minutes, acetic acid was added and dyeing continued for another 30 minutes. The dyed sample faded within 4½ hours, while an analogous sample aftertreated with 15 g/l salicylic acid for 5 minutes at 212°F faded after only 21 hours.

References cited by the Patent Office:

USPat 2,168,337 (Du Pont/1939): increasing the affinity of cellulose acetate for acid dyes by incorporating various amino polymers, among them alkyl amino methacrylate. (Application for this patent had been filed in Germany before that for Brit Pat 480,297).

USPat 2,376,891 (Du Pont/1945): preserving the affinity of wet-spun acetate of cellulose for direct, acid and chrome dyes by impregnating the yarn still in the wet state with a solution of polytriglycol adipamide.

News of the Trade

• TRI Annual Meeting

An outline of the latest strides in textile research and development will spark the 26th Annual Meeting of the Textile Research Institute next month at the Hotel Commodore, New York, N Y. The program for the two-day parley, which has been arranged by Charles S Fowler, chairman of the meeting and Institute trustee, will be as follows:

March 22, 1956

SYMPOSIUM ——— "Minimum Care Fabrics," Arnold Lippert, Joseph Bancroft & Sons Co, *chairman*

"General Principles from the Consumer Viewpoint," Jules Labarthe, Mellon Institute

"Cotton," Paul Stam, Dan River Mills

"Viscose Rayon," T R Scott, American Enka Corp

"Wool," Gerald Laxer, The Wool Bureau, Inc

"The Hydrophobics," R W Peterson, E I du Pont de Nemours & Co, Inc

LUNCHEON SESSION———John H Dillon, TRI director, presiding

Speaker: Malcolm E Campbell, dean, School of Textiles, North Carolina State College

Greetings from Geoffrey Loasby, chairman of the Council, The Textile Institute

March 23, 1956

MORNING PROGRAM———Richard D Wells, Bates Mfg Co, presiding

AFTERNOON PROGRAM———Norman S Grace, Dunlop Rubber Co, presiding

"TRI Research in 1955," Helmut Wakeham, director of research, TRI

"Predetermination of Consumer Desires," Dilman K Smith, Opinion Research Corp

"Industrial Fabrics," Stuart H Sherman, U S Rubber Co

"New Approaches to the Stabilization of Fabrics," Walter J Hamburger and Kenneth R Fox, Fabric Research Laboratories, Inc

LUNCHEON SESSION ——— Sydney M Cone, Jr, presiding

Speakers: "The State of the Institute," Sydney M Cone; "New Problems for Textile Research," Herman D Ruhm, Burlington Industries, Inc

Once again this year's meeting will feature displays and exhibits of textile testing equipment and process and product control instrumentation. These are to be set up in the West Ballroom, adjacent to the meeting room and will be available to the general public on both days from 9:00 am until 5:00 pm.

The Institute's Annual Meetings are open to all interested in research and development in the textile industry. Registration fee for the meeting is $8.00 and luncheon tickets will be available for $5.00 on each day. Advance reservations may be made by writing to the Institute's Secretary, Princeton, N J.

• Cyanamid Consolidates Research Activities

American Cyanamid Company has effected the consolidation of its research activities into a single division under the direction of Kenneth H Klipstein, Division manager, regrouping them geographically so that related activities are brought together at the appropriate research laboratory.

This consolidation, part of a divisional realignment of the Company started two years ago, began with the establishment of a Research Division designed to add effectiveness to the research and development function in the Company's new organization structure. The Research Division, which has coordinate status with the nine operating divisions and carries out research for them, is now implementing a plan to complete the consolidation. The plan involves grouping related activities in laboratories at Bound Brook, N J, Pearl River, N Y, and Stamford, Conn.

An important step toward this consolidation is a construction program to improve the research facilities at Bound Brook and Pearl River.

At Bound Brook, the new facilities, an administration-laboratory building, will house research activities primarily related to the Organic Chemicals and Pigments Divisions. These will include research in the fields of rubber chemicals, textile resins, dyes, pigments and intermediates. The new building will bring together all research activities at Bound Brook which at present occupy a part of several separate buildings. Construction of the Bound Brook project began last fall and is expected to be completed in late 1956.

At Pearl River, plans call for centralizing all Cyanamid's research in the pharmaceutical and biological fields. The laboratories at Stamford will carry on researches in the plastics, agricultural, industrial chemicals and mineral dressing fields, as well as process development and basic research in new fields.

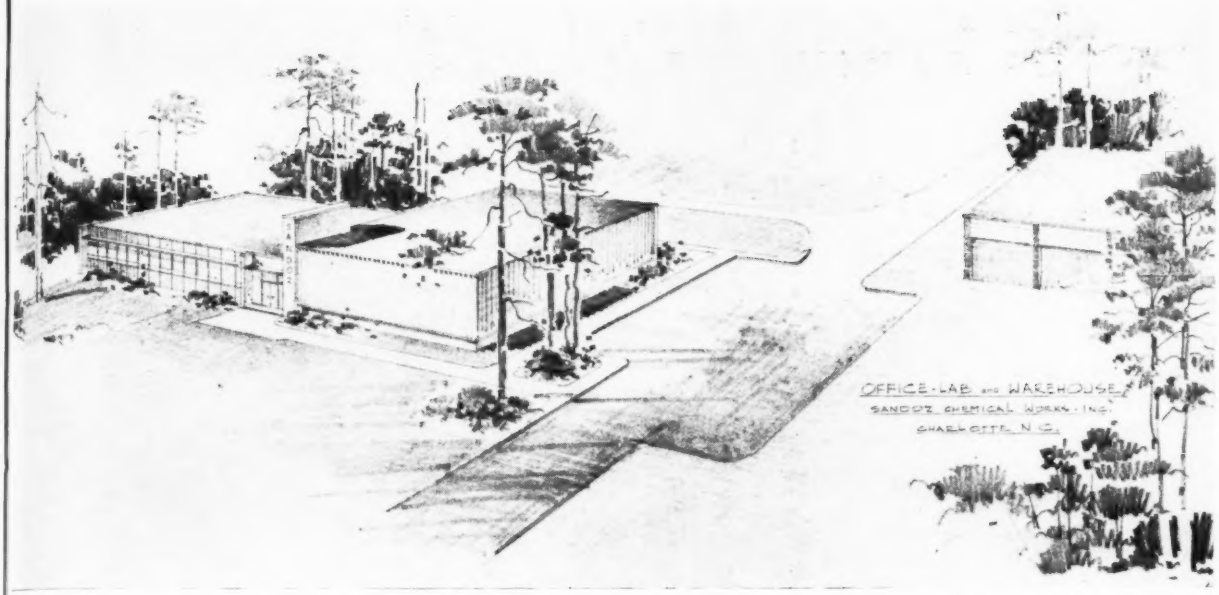
Integration of Cyanamid's research activities into a single division is a sharp departure from the earlier organization of this function. Before January, 1954, research was carried on by three separate Cyanamid organizations; one was the former Calco Chemical Division; another, the Lederle Laboratories Division; and the third, the Stamford Central Research Laboratories.

• Monsanto Consolidation at Everett

Monsanto Chemical Company's chemical melamine facilities at Everett, Mass. are being consolidated and modified to permit further manufacturing efficiencies and increased production. The changes, which will not require shutdown, are expected to be completed by the end of May.

The entire output of the Everett plant, which has been in operation since 1950, is used as a raw material in the production of the company's line of melamine resins.

New Cyanamid research buildings at Bound Brook



Artists' drawing of Sandoz Chemical Works Inc's office, lab and warehouse facilities now in construction at Charlotte, N C

• Sandoz Announces New Building and Expansion Program

Sandoz Chemical Works, Inc has announced the construction of new laboratory, office and warehouse facilities at 4000 Monroe Road in Charlotte, N C. These structures will include the latest equipment for the application of dyestuffs and chemicals on all types of cotton, synthetic and wool fibers.

In making this announcement, James C Walker, executive vice president, announced that Sandoz had recently acquired a substantial interest in Toms River-Cincinnati Chemical Corp, one of the nation's most modern vat dye manufacturing plants. Increased importance of this class of dyestuffs, he stated, necessitated the construction of new facilities at Charlotte, particularly designed to provide the utmost in service, supply, and development of vat dyes.

Sandoz first established offices in Charlotte in 1925 at 435 Church Street. In 1929, the company moved to its present location at 1510 Camden Road.

The Charlotte Branch is under the direction of Frank P Mackinney, manager of Sandoz's Southeastern Territory.

The new office and laboratory will be a one-story building with a full basement under the laboratory wing. The office wing will contain the general business offices, salesmen's office and manager's office. The laboratory will contain a large general laboratory as well as the offices and library for the laboratory personnel. A portion of the laboratory wing will contain a group of "standard condition" rooms in which the temperature and humidity are maintained at a constant state so that the testing of dyed material may be carried on under uniform conditions. The basement area will contain the air-conditioning equipment room, boiler room and transformer vault. Also in the basement will be a special air-conditioned storage area for the storage of special chemicals and dyes. The basement area will be served by a hydraulic elevator to a loading platform on the rear of the building.

The warehouse has been designed for the palletized storage of dyes and chemicals. Movement of materials will be by fork lift truck. Also in the warehouse will be a special room for the standardizing of dyestuffs. The warehouse will be served by a large truck loading platform.

• Cranston Shows "Round-the-Clock" Cottons

Cranston Print Works Company's Dri-Smooth finish was the "star" of a breakfast showing of "Round-the-Clock" cottons on January 10th in the Grand Ballroom of the Hotel Pierre, New York.

The show spotlighted a group of ready-to-wear cottons for family use from dawn to dark; styles for home sewing in Advance, Butterick, McCall, Simplicity and Vogue patterns; a collection of original designs by Vera Maxwell, Claire McCardell, Tina Lesser, Ceil Chapman, Jerry Parnis and Alfred Shapiro; and special scholarship awards to Parsons School of Design students for original textile and fashion designs.

The scholarship awards totaling $800 were presented by Godfrey Rockefeller, Cranston president.

• Record Chemical Display for British Fair

One of the biggest displays ever organized by Britain's chemical industry will be staged in London between April 23 and May 4. It will be held in Olympia Hall as part of the "second edition" of the British Industries Fair. (Heavy industry will be on show at the same time in Birmingham, England.)

The chemical industry's exhibition will be sponsored by the Association of British Chemical Manufacturers as "a fair within a fair." They have taken 50,000 square feet of stand space and will show a wide range of products interesting to overseas buyers.

The dyestuff industry will be well represented. Among other products, it will display a range of synthetic colors which are harmless to health and can be used in foodstuffs and beverages.

Man-made fibers also will appear in abundance and in new applications.

• CCNE Hears Seidel

The Chemical Club of New England met on January 30th at the Parker House, Boston, Mass, to hear George Seidel, Eastern District manager of E I du Pont de Nemours & Co, Inc's Extension Division, discuss "American Industry — An Art or a Science?"

Arrangements for the meeting were made by Fred Baker of Fritzsche Brothers and Loring Litchfield and George Smith of the Du Pont Co, members of the Program Committee.

NAMES IN THE NEWS

Robitschek

Jacoby

The appointment fo F O ROBITSCHEK as president and chief executive officer of Oynx Oil and Chemical Company, Jersey City, N J, has been announced effective January 1.

Formerly general merchandise manager of the Soap Sales Division, Colgate-Palmolive Company, Mr Robitschek was with Colgate-Palmolive since 1946.

Just prior to his executive assignments with Colgate, Mr Robitschek was sent to Germany in 1945 by the Technical Intelligence Commission of the U S Department of Commerce to study the German dyestuffs industry. His findings have been published as the "Robitschek Dyestuffs Report."

In 1944, Mr Robitschek served in Washington as an administrator with the Chemicals Bureau of the War Production Board. His responsibilities included synthetic detergents, fatty acids and alcohols, amino compounds and aldehyde derivatives.

Mr Robitschek began his career with the Marietta Dyestuff Company, Marietta, Ohio.

RAYMOND W JACOBY, consultant to the Ciba Company, Inc, and president of the American Association of Textile Chemists and Colorists, will join the staff of the Department of Textile Chemistry in the School of Textiles at North Carolina State College for two months beginning February 15.

Mr Jacoby will assume teaching and guidance duties in the absence of Prof KENNETH S CAMPBELL, who will be in Peru for a two-month period to supervise the installation of equipment and organize courses in the Textile Chemistry Section of the Department of Chemical Engineering at the Universidad Nacional de Ingenieri, where the School of Textiles of North Carolina State College is currently conducting a government project under the International Cooperation Administration.

Mr Jacoby has been employed by the Rockland Finishing Co, the U S Finishing Co, and the Arkwright Finishing Co. From 1937 until his recent retirement, he served with the Ciba Company, Inc.

Two new additions to the sales staffs of the Goodyear Tire and Rubber Company's Chemical division have been announced.

ORMOND R GILLEN has been appointed sales service staffman and F JOSEPH TRIGGS, JR has been appointed sales trainee.

Mr Gillen will provide customers with technical service involving the uses and applications of the Chemigum and Plioflex rubbers, Pliolite S-6B rubber reinforcing resins and the wing chemicals. He rejoins Goodyear's Chemical Division after 24 months of military service, prior to which he was associated with Goodyear's Chemical Development Laboratories and later with sales research for the Chemical Division.

Appointment of DORMAN COMPTON as technical sales representative to the textile industry in the South has been announced by The Hilton-Davis Chemical Company.

Mr Compton will represent Hilton-Davis' Greenville center in Virginia, West Virginia and North Carolina. He will make his headquarters in Greensboro, N C, however.

Five new sales office appointments have been announced by The Foxboro Company, Foxboro, Mass, augmenting instrument sales engineering service in the Southeast.

E W PRENDERGAST, formerly branch manager at Atlanta, has been made regional manager of the Southeast territory. Joining the company in 1947, Mr Prendergast served as industrial engineer with the Atlanta branch and became manager in 1952. In his new assignment he directs Foxboro instrument sales activities in Mississippi, Alabama, Georgia, Florida and sections of Arkansas, Tennessee, North Carolina and South Carolina.

In other changes, R F SUTTON has been transferred from the Pittsburgh sales office to Pensacola, Florida where he is serving as industrial engineer. Also assigned were industrial engineers F J STEVENS, JR, who will work out of the Lakeland, Fla, branch, H C CRAIG, transferring from Gray, Me, to Jacksonville as branch manager, and L C ESTES, Atlanta branch.

Elsewhere in the South, G W REED, JR, has been named manager of Foxboro's New Orleans office and J K YOUNKINS, manager at Charleston, W Va. Joining the company as industrial engineers were W H RHYNE, T A JONES and M N WALKER, who will be assigned to the Chattanooga, Charlotte and Knoxville offices respectively.

WILLIAM E JACKSON, formerly plant manager of Verney Corp, West Peterborough, N H, has been appointed assistant manager of Dodgeville Finishing Co, Attleboro, Mass.

Mr Jackson has been associated with Dominion Textile Print Works, Quebec, Canada, and Pinatel Piece Dye Work., Joliette, Canada.

The appointment of JOSEPH E NOLAN to the Technical Sales Department has been announced by Glyco Products Co, Inc, Empire State Building, New York 1, N Y.

Mr Nolan has been assigned to the New England sales territory and is basing operations in Worcester, Mass. He was formerly in technical sales with Westvaco.

ARNOLD SILVER, technical superintendent of Colgate Piece Dye Works, Paterson, N J, has joined the faculty of the Textile Department of Fairleigh Dickinson College as an instructor in finishing.

Mr Silver, who has lectured before AATCC and the Fashion Institute, holds two patents dealing with durable embossing of fabrics.

HARRY D ARMITAGE (center), who has been associated with Emery Industries, Inc for 30 years, was honored during the recent Exposition of Chemical Industries in Philadelphia.

Mr Armitage, Emery's New York sales representative, is shown being presented with a 30-year pin by A W SCHOBERT, executive vice president, at Emery's display booth. Looking on is K K BOYD, vice president in charge of sales and purchases.

The following new appointments have recently been announced by the Chemical Divisions of Food Machinery and Chemical Corporation.

JOSEPH GREEN has joined the staff of FMC Chemicals' central research laboratory. He was formerly with the U S Rubber Reclaiming Company, Buffalo, N Y. Pending completion of the FMC Chemicals research center at Princeton, N J, Mr Green is currently assigned to the Becco Chemical Division of FMC at Buffalo, N Y.

JOHN RIVOIRE has joined the development department of Westvaco Mineral Products Division in New York, as manager of market research. He was formerly associated with Pfizer and Company, Inc and with the Midwest Research Institute.

R M HOYER has been appointed district sales manager, Westvaco Chlor-Alkali Division, for the Southern and Ohio Valley territory, and will establish headquarters at Westvaco's South Charleston, W Va plant shortly. Since 1952, he has been successively a Westvaco sales representative in the Cleveland, Pittsburgh and Cincinnati sales offices.

W M CLARK will continue as Southern sales representative under Mr Hoyer, with headquarters at the Charlotte, N C office of Westvaco Chlor-Alkali Division.

Appointment of four field development technicians in the Dyeing and Finishing Division of the Research and Development Department has been announced by The Chemstrand Corporation, Decatur, Ala.

They include: HERBERT F MAHONEY, GERARD O'MAHONY, WILLIAM C PRIVETTE, and WALTER STUMP. Their duties will involve close contact with the dyeing and finishing industry on Acrilan acrylic fiber dyeing projects.

All four have had extensive experience, Mr Mahoney, with Gucrin Mills and M T Stevens; Mr O'Mahony, with Drescotts, Barrymore Cloth, and Fred Whitaker; Mr Privette, with Sovelco Mills, Coplan Converting & Finishing, and Burlington Industries; and Mr Stump, with Burlington Industries, American Viscose Corp, and Huguet Fabrics Corp. Messrs Privette and Stump are members of AATCC.

OBITUARY

Ford

Thompson

EDGAR ROBINSON FORD

Edgar Robinson Ford, 65, technical superintendent at Sayles Biltmore Bleacheries, Biltmore, N C, and a charter member of AATCC, died of a heart attack at his home, 22 Kenilworth Rd, Biltmore, on January 13th.

Mr Ford, a graduate of Lowell Textile School, had been affiliated with Sayles Biltmore Bleacheries for 43 years. He served his apprenticeship with the Sayles firm in Saylesville, R I, and moved to Asheville, N C, when the first Sayles plant was opened there in 1927.

Surviving are his widow, Mrs Catherine Lee Ford; two sons, William Edgar Ford and Richard Bramley Ford, one sister, Mrs Evelyn Ford Fielding; and six grandchildren.

JAMES F THOMPSON

James F Thompson, vice-president of Sterling Drug Inc in charge of The Hilton-Davis Chemical Company Division, died in Cincinnati on the morning of January 18th.

Mr Thompson, 55, joined the chemical company in 1923 following his graduation from the University of Cincinnati. Starting as a chemist, he became vice-president in charge of production in 1942. He was elected vice-president of Sterling Drug, and general manager of Hilton-Davis, in 1949.

A native of Covington, Kentucky, Mr Thompson lived in Amberley Village, a suburb of Cincinnati. He was a member of the American Association for the Advancement of Science, American Chemical Society, Engineering Society of Cincinnati, Sigma Xi and Sigma Alpha Epsilon. A renowned camera hobbyist, he had been a member of the Photographic Society of America and Queens City Pictorialists. He had received a number of exhibition awards.

Mr Thompson is survived by his widow, Mrs Edna Weaver Thompson; two sons, George and Robert Thompson; and two sisters, Mrs James Rogers and Mrs Florence Thompson, of Chicago.

GENERAL CALENDAR

AMERICAN SOCIETY FOR TESTING MATERIALS

Feb 27-March 2—Committee Week, Hotel Statler, Buffalo, N Y; Mar 13-16—Spring Meeting of Committee D-13 on Textiles, Warwick Hotel, New York, N Y; June 17-22—59th Annual Meeting and 12th Apparatus Exhibit, Chalfonte-Haddon Hall, Atlantic City, N J; Sept 16-22—2nd Pacific Area National Meeting and Apparatus Exhibit, Hotel Statler, Los Angeles, Calif; Oct 16-19—Fall Meeting of Committee D-13 on Textiles, Warwick Hotel, New York, N Y.

ASSOCIATION OF BRITISH CHEMICAL MANUFACTURERS

Chemical Display (as part of British Industries Fair)—April 23-May 4, Olympia Hall, London, England.

DELTA KAPPA PHI FRATERNITY

32nd National Convention—April 27-28, Georgia Institute of Technology, Atlanta, Ga.

THE DRYSALTERS CLUB OF NEW ENGLAND

May 4 (Hotel Vendome, Boston, Mass); June 22 (Outing, Wachusett Country Club, West Boylston, Mass)

THE FIBER SOCIETY

Spring Meeting—May 2-3, The Clemson House, Clemson, S C; Fall Meeting—Sept 6-7, Warwick Hotel, New York, N Y.

THE INSTRUMENT SOCIETY OF AMERICA

11th Annual Instrumentation-Automation Conference and Exhibit—Sept 17-21, New York Coliseum, New York, N Y

NATIONAL COTTON COUNCIL OF AMERICA

7th Annual Cotton Research Clinic—Feb 15-17, Pinehurst, N C.

PERKIN CENTENARY

May, 1956—London, England.

PERKIN CENTENNIAL

September 10-15, Waldorf-Astoria Hotel, New York, N Y.

PHI PSI FRATERNITY

Annual Meeting—April 19-21, Alabama Polytechnic Institute, Auburn, Ala.

PHILADELPHIA TEXTILE INSTITUTE

June 14 (Annual Meeting and Clambake—6 pm—College Campus, Germantown, Pa); June 15 (Outing—Manufacturers Golf & Country Club, Oreland, Pa); June 16 (Commencement—College Campus—11 am).

THE QUARTERMASTER ASSOCIATION

Annual Convention—Oct 27-28, Conrad Hilton Hotel, Chicago, Ill.

QUEBEC SECTION, CANADIAN ASSOCIATION OF TEXTILE COLORISTS AND CHEMISTS

Feb 18, Mar 17 (McGill Univ, Montreal, Que); Apr 20-21 (Annual Meeting, Sheraton Mt Royal Hotel, Montreal); June 16 (Annual golf tournament).

SOUTHERN TEXTILE EXPOSITION

19th Exposition, Oct 1-5, Textile Hall, Greenville, S C.

SYNTHETIC ORGANIC CHEMICAL MANUFACTURERS ASSOCIATION OF THE UNITED STATES

Mar 13, Apr 12 (Palm Terrace Suite, Hotel Roosevelt, New York, N Y); May 16-18 (Outing—Skytop, Pennsylvania); June 12, Sept 11, Oct 9, Nov 7 (Palm Terrace Suite, Hotel Roosevelt, New York, N Y)

TEXTILE RESEARCH INSTITUTE

1956 Annual Meeting—March 22-23 Hotel Commodore, New York, N Y.

TEXTILE TECHNICAL FEDERATION OF CANADA

5th Bi-annual Textile Seminar—June 5-7 Queen's Univ, Kingston, Ont.

• NEW PRODUCTS AND DEVELOPMENTS •

• Du Pont Purchases Technology of New Dyeing Process

The Du Pont Company has announced the recent purchase from Cheney Brothers of Manchester, Conn, of the technology of a process for applying acid dyes and Capracyl dyes levelly to woven filament nylon fabrics in a covered jig.

The process reportedly produces dyeings with acid colors as uniform and level as normally observed with disperse dyes. It also is said to improve the light fastness, particularly for dull nylon, and effect a saving in the amount of dye required. There is essentially no change in wet fastness properties of dyeings with acid colors when the Cheney method is used, it is claimed.

The Cheney process, which has been practiced by the firm commercially for the past two years, may also be applicable for other fabric types, such as tricot. The Du Pont Company is working on this development at present.

The process requires certain special handling techniques. Its release will be through the company's Organic Chemicals Department's district offices.

• Lanasyn Yellow 3GL Pat

Lanasyn Yellow 3GL Pat, a new neutral dyeing, premetallized bright greenish yellow dyestuff manufactured by Sandoz Chemical Works, Inc, is said to have particularly good fastness properties on nylon, giving ratings which exceed maximum on the standard Fade-Ometer scale. Its fastness to sunlight is also said to be very high. For wool dyeing, Lanasyn Yellow 3GL Pat reportedly shows a fastness rating of 6-7 in Fade-Ometer tests.

Sample material, type and price data, and a limited quantity of shade card inserts are available from the seven Sandoz offices in the United States.

• Dispersion 108

Miller-Stephenson Chemical Co, Inc, 550 Fifth Ave, New York 36, N Y, has announced the availability of Polyisobutylene Dispersion 108, a new aqueous dispersion of Vistanex*.

The product is unloaded and reportedly yields a colorless, tacky film when the moisture is removed. It is said to be compatible with natural and synthetic latex, and to be outstanding in its stability, resistance to aging, and chemical inertness.

Suggested uses include: textile coatings; textile laminating; adhesives for flock printing; binder for cellulose, textile and leather fibers; modifier for dextrene, gums and starches; additive for latex compounding, etc.

A bulletin on the product, giving general information, specifications and properties, method of dilution, and commercial information is available from M-S Chemical Co on request.

• Niatex AG-2

Important progress in the development of a durable antistatic treatment for synthetic textiles has been achieved in the development of a new finish, Niatex antistatic AG-2, according to a joint announcement by W A Woodcock, manager of the Fine Chemicals Division and T A Feild, Jr, head of the Development Service Laboratories of the Textile Fibers Department, Carbide and Carbon Chemicals Company, a Division of Union Carbide and Carbon Corporation.

In describing the new finish, Mr Woodcock stated that antistatic AG-2 is believed to be the first commercial antistatic finish that can be said to be durable both to repeated launderings and to repeated drycleanings. The finish is a complex vinyl type of compound.

No catalyst or high-temperature curing is required. Niatex antistatic AG-2 is diluted with water and applied to the fabric by padding or spraying, and thoroughly dried. Extensive tests reportedly have indicated that excellent protection can be obtained over repeated launderings, depending on the fiber content of the fabric and the method of application. On Dynel fabrics, for example, Mr Feild explained that "the extent of antistatic protection achieved with AG-2 is such that the fabrics show no dirt pick-up after rubbing on wool, zero voltage as measured on suitable electrostatic voltmeter immediately after similar rubbing, and a volume resistivity less than $5 \times 10\text{-}9$ ohm/cm^3 is recorded." Fabrics with these three characteristics are considered to be essentially static free.

The finish is described as a viscous, white-to-light-amber liquid. It is shipped as a water solution and reportedly can be mixed with water or any of a wide variety of organic solvents, and may be of use in applications employing propellants. For application during drycleaning, Mr Woodcock pointed out, an emulsion of the antistatic agent may be made in the drycleaning solvent itself.

The new finish is also said to be compatible with many types of resins, water repellents, stiffening agents, and softeners. The antistatic durability of various combinations of finishing-materials with AG-2 varies somewhat, so tests must be made in specific cases. It is suggested that fabrics used in hazardous locations be rechecked at frequent intervals.

According to Mr Feild, the new finish is most effective on fibers with irregular cross-sections. Thus, it is difficult to remove from Dynel except in hot alkaline solutions. On Saran it withstands surprisingly long abrasion tests, but will not withstand scouring. It is effective on Orlon, and is being used on Dacron tricot, primarily to improve the fabric hand.

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